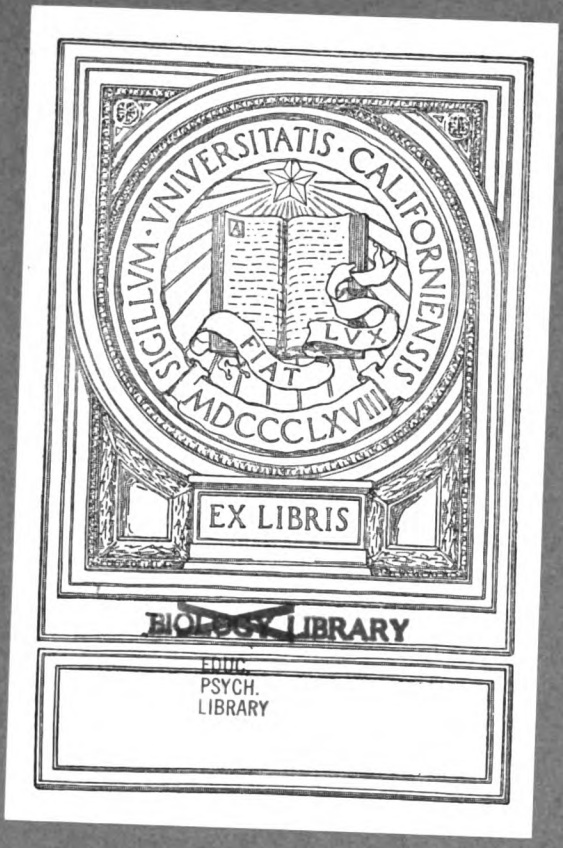

THE JOURNAL OF MENTAL SCIENCE

BY AUTHORITY OF
THE ROYAL MEDICO-PSYCHOLOGICAL ASSOCIATION

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" In adopting our title of the *Journal of Mental Science, published by authority of the Medico-Psychological Association*, we profess that we cultivate in our pages mental science of a particular kind, namely, such mental science as appertains to medical men who are engaged in the treatment of the insane. But it has been objected that the term mental science is inapplicable, and that the term mental physiology or mental pathology, or psychology, or psychiatry (a term much affected by our German brethren), would have been more correct and appropriate; and that, moreover, we do not deal in mental science, which is properly the sphere of the aspiring metaphysical intellect. If mental science is strictly synonymous with metaphysics, these objections are certainly valid; for although we do not eschew metaphysical discussion, the aim of this JOURNAL is certainly bent upon more attainable objects than the pursuit of those recondite inquiries which have occupied the most ambitious intellects from the time of Plato to the present, with so much labour and so little result. But while we admit that metaphysics may be called one department of mental science, we maintain that mental physiology and mental pathology are also mental science under a different aspect. While metaphysics may be called speculative mental science, mental physiology and pathology, with their vast range of inquiry into insanity, education, crime, and all things which tend to preserve mental health, or to produce mental disease, are not less questions of mental science in its practical, that is in its sociological point of view. If it were not unjust to high mathematics to compare it in any way with abstruse metaphysics, it would illustrate our meaning to say that our practical mental science would fairly bear the same relation to the mental science of the metaphysicians as applied mathematics bears to the pure science. In both instances the aim of the pure science is the attainment of abstract truth; its utility, however, frequently going no further than to serve as a gymnasium for the intellect. In both instances the mixed science aims at, and, to a certain extent, attains immediate practical results of the greatest utility to the welfare of mankind; we therefore maintain that our JOURNAL is not inaptly called the *Journal of Mental Science*, although the science may only attempt to deal with sociological and medical inquiries, relating either to the preservation of the health of the mind or to the amelioration or cure of its diseases; and although not soaring to the height of abstruse metaphysics, we only aim at such metaphysical knowledge as may be available to our purposes, as the mechanician uses the formularies of mathematics. This is our view of the kind of mental science which physicians engaged in the grave responsibility of caring for the mental health of their fellow-men may, in all modesty, pretend to cultivate; and while we cannot doubt that all additions to our certain knowledge in the speculative department of the science will be great gain, the necessities of duty and of danger must ever compel us to pursue that knowledge which is to be obtained in the practical departments of science with the earnestness of real workmen. The captain of a ship would be none the worse for being well acquainted with the higher branches of astronomical science, but it is the practical part of that science as it is applicable to navigation which he is compelled to study."—*Sir J. C. Bucknill, M.D., F.R.S.* (*Journ. Ment. Sci.*, vol. vii, 1861, p. 137).

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JOURNAL OF MENTAL SCIENCE

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Part I.—Original Articles.

PSYCHOGENIC AMNESIA: THE REFUSAL TO REMEMBER.*

By Sq.-Ldr. D. N. PARFITT, M.D., M.R.C.P., D.P.M., R.A.F.V.R.,

AND

Sq.-Ldr. C. M. CARLYLE GALL, M.R.C.S., L.R.C.P., D.P.M., R.A.F.O.,

Neuro-psychiatric Specialists, R.A.F.

THE differential diagnosis of a presenting symptom is usually to be found as a section of an article on a disorder in which the particular symptom is common. Thus one learns a great deal about the widely different pathological processes responsible for epigastric pain in a description of peptic ulcer, and much about headache in descriptions of cerebral tumour or migraine. Amnesia is peculiar in this respect in that succinct expressions of its differential diagnosis are rarely found in the description of individual disorders.

This peculiarity probably arises from the striking nature of the symptom, which has tended to be isolated as a subject in itself. One result of this has been the elevation of amnesia as "loss of memory" to an eminence undeserved by its clinical importance, where it poses as an entity out of keeping with its diversity, certainly to the lay world and, we suspect, to a large section of the medical profession.

Gillespie (13) rightly says, "A discussion on amnesia must involve both physiologic and psychologic concepts," as must a discussion on weakness of the legs, but it must be made clear that uncertain gait is merely a common incidental to the different pictures of emotional stumbling and general paralysis. Many authorities lend support to a superficial interpretation of their opinions as favouring the homogeneity of amnesia, examples associated with trauma or Korsakow's syndrome being cited to illustrate certain aspects of problems under discussion without the distinction from psychogenic amnesia being clearly maintained, even although each remark is clear and pertinent in its own context.

Amnesia is very common during wartime (29), but is by no means a rarity in peace, and we have the impression that its incidence was increasing before the war.

EXCLUSION OF ORGANIC AMNESIA.

The psychiatrist is concerned with amnesia arising out of emotion and mental conflict, and however difficult the disentanglement of psychogenic from organic amnesia may be on occasion, the difference between them should not be minimized.

As a generalization, organic amnesia is concerned more with failure of registration and more so of retention than with the process of recall, which is the seat of failure in psychogenic amnesia.

Abeles and Schilder (1) recorded cases of amnesia with loss of personal identity

* A paper read at the Annual Meeting of the Royal Medico-Psychological Association at 11, Chandos Street, Cavendish Square, London, on July 28, 1943.

in diseases as far apart as arterio-sclerosis and schizophrenia, and as carbon monoxide poisoning and hysteria, but do not make as clear as is desirable the vast difference between the amnesia of cerebral softening and malingering, or between the organic and the psychogenic in general.

The investigation of amnesia involves a full clinical history and physical examination, with laboratory and X-ray aid where necessary. The dissection of amnesias into separate functions, such as personal or everyday memory gaps or isolated mathematical failures, and their relationship to various organic diseases, localized or not, is a task for the neurologist, as is the consideration of the phenomenon of good retention in toxic states, despite the presence of disorientation, except in so far as the symptoms may be psychogenically coloured.

The only safe differentiating process is to consider the symptoms in relation to the total picture presented, regarding the amnesia as a comparatively minor manifestation overshadowed in importance by the whole reaction. There is no single criterion for clinical application.

If complete intellectual capacity is present from the beginning the amnesia is probably psychogenic, but confusion and disorientation may be prominent in the complete absence of organic changes, varying from mild uncertainty and agitation to a profound abeyance of intellectual qualities indistinguishable from a temporary confusional psychosis (23). On the other hand, traumatic amnesia in boxers and footballers is compatible with behaviour apparently identical with that to be expected where complete intellectual capacity exists. This last observation raises queries. Several footballers we have examined who claimed not to remember what happened after a head blow, although they continued to play intelligently, have been theatrical personalities, akin to the " simple, superficially well adapted, extraverted type of personality " described by Sargant and Slater (29) in their paper on amnesia, and boxers as a group are a fruitful field for psychoneurotic reactions. The unquestioned occurrence of the " punch-drunk " variety of dementia is perhaps a reason for ascribing some of these fistic amnesias to organic causes when hysterical reactions would be a more accurate label. Verjaal (32) takes the view that so-called traumatic amnesias are all psychogenically determined and are not organic defect phenomena, but his blunt opinions are not generally accepted.

The points made by Lennox (21) about epileptic amnesia are applicable fairly generally. Very often a patient with an organic amnesia attempts to proceed with his work; even though his behaviour is obviously abnormal and although sympathy and care are provided, he remains puzzled and unhappy. The patient with a psychogenic amnesia shows the opposite of each point, but by no means invariably.

Psychogenic amnesia is more usually selective and convenient, but trials and emotional conflicts are so widespread that sometimes an excellent precursory psychogenic situation can be made out in undoubted organic cases. The end-point of psychological amnesia is more often clear-cut, but an organic amnesia may appear to be equally clear-cut. Thus a recent patient remembered cycling into a village near York, and, next, distinctly recalled getting off his cycle to speak to friends on the far side of York, where his home lay, but this was not the whole story. His friends remarked upon abrasions and bruising of his face, and he then noticed that the front mudguard of his cycle had disappeared. He continued towards home, and remembered his arrival and actions thereafter quite clearly. It transpired that he had spoken to his friends on the near side of York, so that he had ridden through the town without being able to recall this part of his journey, although he gave an accurate description of certain actions and a conversation preceding it. In other words, he was registering and retaining impressions correctly while he was disoriented in time and space—a well-known organic phenomenon. The amnesic periods of general paralysis are often clear-cut, although they are not often prolonged. Russell (27) never observed a retrograde amnesia longer than seven days in head injury cases, so that anything longer would suggest psychogenesis.

If organic changes, progressive or temporary, are discovered in the nervous system, it is necessary to consider whether the amnesia can be accounted for as a purely organic phenomenon, as it may be in cerebral growths, inflammations and degenerations, in epilepsy and toxic states, or whether psychogenic factors have also to be weighed in deciding the mechanism of origin. The organic changes may

not be causal but merely act as precipitating agents. An organic amnesia may be followed or widely overlapped by a psychogenic failure of recall, as is commonly seen after head injuries, and sometimes in alcoholism and epilepsy. Schilder (30) emphasizes the particular value attached to the head in an individual's psychological experience and the frequency of psychogenic symptoms after a threat to the brain.

The hysteric uses his own conception of an organic disease as the structural skeleton for his symptoms, and this symptomatic basis is most satisfactory for his purpose when the simulated disability has existed or in some measure still exists. Freud (11) pointed this out in 1905, describing psychological symptoms referable to a diseased organ or one previously diseased and terming the process somatic compliance.

Hysterical amnesia is particularly liable to follow organic amnesia occasioned by head injury, arteriosclerosis or toxic confusions, provided that the patient has a sufficiently hysterical personality. For this reason it is not valid to exaggerate the extent of organic amnesia in head injuries because amnesia follows cerebral trauma and not fractured limbs, any more than it would be justifiable to conclude that because a fractured skull was followed by hysterical amnesia, there were no organic changes present.

Not only may organic changes and their effects dovetail with or facilitate psychogenic amnesia, but the two conditions may exist side by side without connection. Lastly, any organic bodily changes may produce reactive emotion, and this emotion facilitate psychogenic disturbances.

Differentiations of Psychogenic Amnesias.

There are two main divisions of psychogenic amnesia which are well recognized—the hysterical, described by Gillespie (13) as a " device intended to facilitate escape from the consequences of evasion of duty which is often nothing more than malingering," and the affective, an escape from the memory of an intolerable experience. The latter may not be mentioned unless asked after. A tendency exists to discuss both together as if they were the same thing—an assumption made more readily because hysterical amnesia is preceded by emotion and often by prolonged or intense emotion. If a man avoids a district because it contains the house in which his only son died, and another avoids a district because the police are there watching for him, these two men cannot be considered as exemplifying the same reaction, although they share a common aversion. The two chief groups of psychogenic loss of memory are similarly different, although the same type of mechanism is probably operating in both.

It is to be expected that sometimes it is impossible to place a particular amnesia comfortably into one division or the other—a type of situation common to the diagnosis of a great many conditions and particularly to psychological disorders, gradations between standard psychoneurotic reactions being as common as the complexity of personality responses would lead one to suppose. Hysterical symptoms may thus easily appear in anxiety states arising out of inadequacy due to obsessive compulsive habits of thought, and so on, the various labels being only useful descriptive terms for grouped human reactions, and not diseases. In this case, despite the difference between clear-cut examples of each, there can be no final separation because in the last analysis both reactions arise out of what appear to the patients to be intolerable situations. It is the setting of the symptom that is different, sometimes vastly different.

Sargant and Slater (29) in a recent paper describe amnesias and fugues occurring especially in hysterics and anxiety states, frequently in depressives and hypochondriacs and sometimes in schizoid personalities. They record amnesia in an obsessional psychoneurosis, and in two cases of plain malingering, and discuss amnesia in head injury and epilepsy, illustrating the symptomatological nature of the condition. Many of their cases followed severe battle stress. Roughly speaking constitutional weakness was inversely proportional to the stress needed to precipitate symptoms. In their opinion the discipline of service life makes amnesia more easily detected; they found " large gaps retrospectively in the patients' memory of the past," and state that such gaps " are often overlooked in civil life." But this kind of amnesia, for an acute emotional experience which

should normally be remembered, to which the patient would not willingly draw the physician's attention and which can be easily overlooked, should be separated from an amnesia which may be malingered and is in any case advanced by the patient as his presenting symptom. Both varieties are distinct from the vague, hypochondriacal memory disturbances which sometimes follow head injuries, even very minor head injuries (30).

Defensive Amnesia.

Where amnesia is not complained of and is purely defensive against the pain generated by highly emotional memories, we propose that the term "defensive amnesia" be used to describe it. We do not think that the term "hysterical amnesia" can be bettered at present for the usual "loss of memory" which, in peacetime certainly, is by far the commoner. The dramatic fugue, which so often characterizes the hysterical amnesia, could never occur in a defensive amnesia.

The Data from Our Cases.

This contribution treats of 30 cases of hysterical amnesia, the diagnosis being made by positive evidence of a psychogenic process consistent with such a diagnosis and by the exclusion of other causes. Our cases were all serving men of the R.A.F., so we are unable to comment on sex incidence, but according to Kanzer more men than women develop this symptom (19). Their ages varied between 16 years and 44. Kanzer's patients were chiefly between 20 and 40 years of age, and 25 of our 30 were in this age-group—three being under 20 and two over 40. The average was a shade over 26. Kanzer found married patients in the majority, but only 11 of our series had been married. One would want very careful age-grouping and large numbers of cases to make any assessment of marital influences.

The Constitutional Factor.

Sargant and Slater drew attention to the evidence of constitutional predisposition to psychoneurotic disorders provided by the life-histories of many of their cases and we can confirm this observation. Many of our patients could be fairly described as hysterical personalities apart from their amnesia, being egocentric, over-dependent, and immature to a degree. Some were of the superficially well adapted, extraverted type described by Sargant and Slater, others being dull, submissive and generally nervous (25), but inclined to entertain ambitious day-dreams of a kind akin to schizoid meanderings.

In the early days of the war a point system for the assessment of predisposition was devised at Matlock by Air-Commodore Gillespie, Wing-Commander Rumball and one of us (C. C. G.), in which points are scored for certain positive traits of personality, character and temperament, which experience has shown indicate a predisposition to neurotic breakdown. It was found satisfactory for purposes of comparison to regard any score of six and over as indicating heavy predisposition, and 21 of our 30 cases scored six or more, the average predisposition rating for the whole group being 6·5, the score varying from 0 to 10.

Intelligence.

No estimate of the intelligence quotient was attempted in the majority of our cases. Only six had reached the rank of corporal or higher, but this is offset by the further facts—that the hospital is reserved for ranks other than officers, and that the average duration of service of 26 of our cases was rather less than one year. The other four averaged nearly 14 years' service. Seventeen patients were engaged in "general duties," that is, had no skilled trade whatsoever, and only two were members of air crews. One man was dull and backward, almost to the level of being a high-grade feeble-minded person; another was an honours B.Sc. We have the impression that the level of intelligence was not so low as might be expected in hysteria in general, even among those of our cases where the principal diagnosis was hysteria.

Diagnosis.

The amnesia was an hysterical manifestation in each case, but in only 20 was hysteria the primary diagnosis, two of these showing acute anxiety symptoms and

another being admitted in an hysterical stupor. Six were psychopathic personalities, five inadequate and one aggressive, three of them showing evidence of acute anxiety. The remaining four were schizoid personalities.

Precipitating Causes.

Prolonged emotional dissatisfaction, with frustration and self-pity, arising from service routine, discipline and monotony and associated with a craving for home, sympathy and security, was a factor in the majority. In at least twelve it was the only precipitating factor discovered. Several had worked up grudges against the service, in three cases aggravated by ideas of reference, and in these prolonged disgruntlement had crystallized into an obsessing idea—" I can't stand it; I must get away," a fugue following.

Three men were experiencing acute emotional conflicts about a fiancée, two about their father. Only two or three had run away from danger. Failure to obtain a commission and responsibility beyond acceptance were occasional. One patient was remorseful about a dereliction of duty. Gillespie (14) says, " In peacetime most cases I have seen of recent years were flying from justice in some sense or another, and all of them recovered their memory in a short time, with varying degrees of gradualness and grudgingness." Our cases were flying from authority and not justice. Four suggested a recent trivial head injury as the cause of the symptom, and several others mentioned some minor head injury received years before.

Eight had been drinking more than usual, only two of them excessively. As a rule we considered the alcoholic indulgence a neurotic symptom, like the amnesia, although the question arises whether there has been a brief organic amnesia providing a pattern for an hysterical prolongation.

Fugue.

Twenty patients had fugues. In five cases the fugue lasted less than eight hours, in eight more than twelve hours and less than one day, in three it persisted over several days, and in four it lasted from two weeks to two months.

Amnesias without fugue were more likely to be associated with brief, highly emotional experiences which are excluded from memory. They were not defensive amnesias, because the loss of memory was the presenting symptom and behaviour was theatrical. They were demands for sympathy or recognition or both.

Physical Examination.

In no case was an organic disease process discovered in the nervous system or elsewhere.

About a half-dozen patients showed most of the following signs: General appearance of illness or of distressing, chronic anxiety; loss of weight; dark shadows under the eyes; dilated pupils, sometimes sluggish in reaction; exaggerated tendon reflexes; increased perspiration, most noticeable on the palms; tremors of fingers and eyelids; jerky muscle movements.

At the risk of appearing irrelevant we should like to define our atttiude to these changes, which can be taken roughly as signs which can be grouped as the physical evidence of anxiety. Any one sign and sometimes several can be present under conditions of first-rate health. Most severe anxiety states show several of these signs and they are sometimes prominent in other psychoneuroses, but severe anxieties can occur in their absence. A peculiar irregular twitching of the eyeballs, seen best when examining the disc with an ophthalmoscope, is the most exclusively " neurotic " sign we know, but it is oftener not present and is by no means pathognomonic when found. These physical signs are of more significance if they clear under treatment, but they are not then of much use in diagnosis, which in any case must be made irrespective of their presence.

Several described anxiety dreams, and more complained of headaches. A few wanted relief from insomnia.

Of the 30 patients, 24 returned to duty and 6 were invalided directly from the hospital. More may have been invalided since.

The Running Away of Children.

Amnesias and fugues are rare in children (19), but children frequently run away, in mixed emotional states deriving from insecurity, frustration, disappointment and resentment. They run from their parents or guardians, sometimes to punish them, sometimes as a dramatic protest, usually with the idea of winning success and recognition elsewhere.

The wanderings of restless or inquiring younger children and the simple wilfulness of some youngsters are excluded. One of our patients ran away at 13 years. He went soon after tea, when his parents were away for the day, leaving a note for them on the kitchen table. He had vague but grandiose ideas of making his fortune and confronting his parents with his success, achieved despite them. About nine o'clock in the evening it was cold and dark, and he grew frightened and decided to return. Having made this decision he became acutely affected by humiliation and shame at the collapse of his determination, and raced back in a frantic effort to get his note before his parents saw it. He had a fugue and amnesia at 22.

Another patient ran away for a day when he was 10 and for three days when he was 13, being brought back by the police after a general alarm; on neither occasion was there any question of amnesia, yet at 17 he had a fugue with amnesia while in the Navy and again at 18 in the R.A.F., having been invalided from the Navy for schizoid personality associated with amnesia. Some change had taken place between the ages of 13 and 17 which transformed a running-away into a fugue with amnesia.

It happens often in adults that a fugue commences as a running-away comparable in every way to a childish escapade. Kanzer described a man who having given a worthless cheque, went off, leaving a note for his wife stating that he would never return until he had made good and was able to redeem his cheque, but was found wandering in an amnesic state a few days later. Men have run away, begun drinking heavily and then developed amnesia, and many of our patients began their fugue in full consciousness. A colleague, Flight-Lieutenant J. Walsh, explained the mechanism of amnesia to a disgruntled member of an air-crew who had disappeared for a time from his station. During this patient's stay in hospital he ran away to his home twice, without developing a further amnesia. It is not hard to find cases indistinguishable from an hysterical fugue with amnesia except that there is no amnesia.

Case.—A paranoid personality, not included in our series, was disturbed by ideas of reference, acute sensitivity to fancied neglects and slights, and was sometimes the victim of good-natured banter from his more robust colleagues. He developed grudges and feelings of inadequacy and was sent to Matlock, where he showed apparent progress and later was posted to a new unit in Cornwall. A week after commencing there his symptoms were worse, he felt that his thoughts were read, experienced feelings of unreality and began to drink more alcohol than usual, finding himself distinctly more susceptible to its action. One Friday night his mates were particularly persistent with their leg-pulling, and following this he reported, "I could stand it no longer, I had to get away. Early the next morning I rode off on a bicycle to the village and took a taxi from there to the nearest main line station. I shared it with an airman going on leave and we travelled to Bristol together. He didn't suspect anything; I didn't want him to know. When I got to Bristol I was in a sort of black-out; I didn't know what I was doing. I hung around the station all Saturday night—I was dazed. I could only think I must get away, that's all, and on Sunday I suddenly thought of Matlock and went there, getting in at 22.00 hours. I can remember practically nothing." This is a good example of emotional preoccupation to which we shall refer later.

Kanzer drew attention to similarities between many cases of amnesia with fugue and frightened children or fainting youths. Six of our patients gave a history of having fainted when younger. Certainly the comparison of many, if not most, hysterically amnesic patients with children is inevitable, and as a group they are immature and childishly fanciful. H. G. Wells thought that children were such delightful actors because their natural, easy, dramatic sense was unspoiled by adult inhibitions and self-criticism, and in the hysteric this uncritical play-acting persists to a degree that is sometimes almost incredible. Gillespie (14) penetrates

to the core of this observation by his suggestion that the hysterics should henceforward be termed the histrionics.

Abeles and Schilder state that almost always the patients have been living with close relatives and ran away from parents, the family or their representatives, doing themselves no harm, or very little. Our cases were all away from home, but if superior officers represent parental surrogates, the conception holds, and the infantile nature of the reaction is further illustrated.

Emotional State before the Amnesia.

The amnesia was preceded by an acute emotional upset in at least 43 of the 71 cases reported by Kanzer. The origin of the emotion varied: in younger people blighted love was common, in older persons business worries in men and domestic problems in both sexes were frequent, while criminal responsibility of some kind was often found at any age-period. In all cases the total situation produced a degree of anxiety or fear, while symptoms, such as depression, insomnia, loss of appetite, lack of concentration, anxiety dreams and emotionalism were common. The origins of the conflict often appear slight to anyone except the patient, but the facile emotional reactions that follow frequently obtain the sympathy and concern of the patient's immediate circle. Several of our patients mentioned that they were acutely conscious of a failure of memory in small things before the amnesia, their description suggesting the absent-mindedness associated with preoccupation and mental distress. Eventually they became limited in their ideas to a recurring theme: " I can stand it no longer; I'd sooner be dead; nobody cares about me." The self-pity associated with the idea that " nobody cares " was very common.

Some of our cases seem to have worked themselves into a genuine state of fatigue arising out of prolonged emotion. Such fatigue is not always easy to detect, because the ability to carry on with routine duties persists in spite of quite severe symptoms.

Case.—An intelligent corporal, a schoolmaster in civil life who had supplemented his interests with energetic activities in scouting, play production and athletics, became gradually and increasingly dissatisfied with service routine. His grudges came to a head when he was frightened by parachute jumping and angered by a failure to obtain a commission. He came to hospital with severe hysterical fits, and as part of his investigation was sent for an electro-encephalographic examination in the company of another corporal. On the way he staged a very severe fit on Birmingham station, sufficiently dramatic to produce a policeman's report stating: " I found the man very ill, and on account of his serious and dangerous condition had him removed at once to hospital." Following his EEG he was brought back and his adventure ignored. After a few days he had an amnesia and fugue; he was found eight miles away in his carpet slippers, and was taken to a police station in a confused state. A reliable eye-witness stated that he looked ill and harassed to an extreme degree. He was treated by being bluntly informed that it was now clear that his health was excellent, and that he was being sent back to his unit as a malingerer to be court-martialled for deliberately attempting to evade his duty. This high-handed approach is not recommended, but it produced a complete cessation of fits, the story of the amnesia and the request for a few weeks longer in hospital to get thoroughly fit. Even exposed in this way he remembered to snatch at possible favours. About the amnesia he said: " I was upstairs in the occupation room; I felt absolutely fed up. No one seemed to care what happened to me; I felt I just had to go somewhere, anywhere. I went out about eleven o'clock and walked along the main road. In the first village I came to I realized people were looking strangely at me, and when I came to another little hamlet two men took me to the police station. When the nursing orderly arrived it gave me such a shock, as I realized the position I was in. For a moment I could recall nothing since I was upstairs in the occupation room." It is to be noticed that he started his amnesia when the nursing orderly arrived to fetch him.

Kanzer states that attacks most often come on when the patient is alone, travelling in a train or walking in the street. In the case just described, the fugue began in a crowded occupation centre, and the inability to recall was noticed when a nurse arrived to fetch him. The next case is interesting in this connection.

CASE.—An inadequate psychopath with a predisposition score of nine. He had run away for a day at the age of 13. A few months after joining the R.A.F. he was found wandering by his mates and taken back to camp. Several months later he was released for civilian factory work for nine months, during which he worked at the same bench as his wife. On his recall to his unit he became depressed and could not eat or sleep. After three weeks of rising emotional tension he lay on his bed in his billet after duty one January evening while his three room companions comforted him in vain. About 10 p.m. he left them; they said nothing, and he thinks they presumed he was going to the lavatory. He slipped out of the house—it was cold and raining—but after a few minutes he made his way to a large tree in the corner of a field where, by lying on his back, he could wriggle under the barbed wire surrounding the grounds. He climbed an embankment on to a side road which led to a main road, and kept along this. He soon came to a village, where a boy passed him on a bicycle and fell off turning a corner. The patient hid in a doorway, feeling alarmed, as he did not want to be discovered and yet thought he should go forward and help. He then thought he heard a man helping the boy, and when it was quiet he went on again. In about three hours he saw a chink of light from a hut near the road. He had only slippers on and no greatcoat, and was soaked and very cold. He was strongly tempted to approach the light, but went on for about a hundred yards and then went back. In the hut he found a soldier on duty, and in reply to questions told him he could remember nothing, " I felt too unhappy to think." The soldier telephoned through to a larger hut, where the patient was bedded for the night.

Here, again, the commencement of the amnesia can be fixed at a definite moment, the same moment as in the previous case, when the patient was first asked for information about himself. Until then he was aware of his identity and of the necessity to hide to escape detection. The possibility of suggestion coming from the first questioner of a patient found wandering or who has given himself up must be considered. In some cases it almost certainly occurs. Eysenck (9) provided evidence which cast doubt on the increased suggestibility of hysterics as compared with average groups of the community. In these two cases we feel the amnesia commenced because of the active desire of the patients, the picture being complicated in the second case by a degree of fatigue.

Other hysterical symptoms in addition to the amnesia are rare. Kanzer quotes two cases of hysterical blindness in his 71 amnesias. This is an extreme form of the visual component often used by the patient to reinforce his conception of a blotting out of memory. Such phrases as " everything went black," " a veil came over me," " a fog came before my eyes," " I suddenly saw black " and so on are often heard.

THE FUGUE AND SUBSEQUENT BEHAVIOUR.

Fugues may be of short or of long duration. An artificial but convenient dividing line is at eight hours, for at least after this time the patient is almost always forced to seek sustenance.

In short fugues the patient is more likely to wander aimlessly, to be highly emotional, to be found agitated and confused and generally to give an impression of being ill. Often hunger, cold or other distress leads the patient to seek help from convenient strangers, or his dress or behaviour is calculated to arouse interest. In long fugues the patient travels far, appears perfectly self-possessed and lives in every way like a healthy human being except that he is not where he should be. He may exhibit some distress when found or on his return, but it is clear that his condition has not given rise to notice by the many people who must have seen him.

When taken under care they may claim an amnesia only for the period of their flight, or the loss of memory may be retrograde to any extent up to the whole life. They may give their names or state that they are unaware of their identities. In our experience the short fugues are less often complicated by loss of personal identity. If identity is not vouchsafed they sometimes reveal useful hints leading to their identification, or they may give no help whatsoever. The experiences remembered may refer to the precipitating emotional setting or may be the central piece of what is forgotten (19); e.g. a husband or the recent birth of a baby may be denied recall.

The following is an example of amnesia claimed for the whole of life.

CASE.—An immature, undersized youth cycled to his 16-year-old girl's house and made love to her, reclining on a couch. The intensity of her caresses startled him considerably and he rolled to the floor and bumped his head. He was sexually inexperienced, and the passion of the youthful Delilah had roused counter feelings and a sense of temptation of which he had hitherto been ignorant and he was disturbed and frightened. He started to cycle home, and from that moment claimed to have forgotten his whole life. This complaint was still present when he came to hospital two months later. He carried a diary, regularly kept, which contained his new experiences and abounded with such quotations as "Saw my first aeroplane to-day," "Played a funny game called football." His vocabulary, ability to behave in his surroundings and absorb knowledge were phenomenal if his story could be accepted. Any slip he made about his past he attempted to explain by saying that he had looked it up in his diary, as he thought his doctor would like to know about it. Here we have a naïve, childish phantasy, played out with great relish. As Hurst (11) says, "He has no difficulty in adapting himself to his new surroundings" . . . he can read and write, and has all the elementary knowledge he acquired as a child, but anything recently learned, such as soldier's drill, is forgotten."

Kanzer reports a kind of reactive depression occasionally met after fugues. Stengel (31) describes a depressive state initiating fugues. Most of our cases had depression before the fugue, but its nature appeared to us to be superficially reactive to situations that were considered intolerable.

Gillespie says, "Amnesia suggests shame." We found this in a few of our cases, concerning sex or duty, if by shame is meant an emotion arising out of the forgotten experiences. Sargant and Slater found about one in ten of their cases with a sense of guilt. A much commoner and more potent cause of shame is the humiliation that accompanies the decision to end a fugue, especially if the fugue has been preceded by a highly emotional state.

Stengel has written of fugues having in mind recurrent compulsive wandering rather than amnesia. Several of his cases had travelled abroad and been absent over months. They were often psychoneurotics and sometimes schizophrenics, but included a large number of epileptics. He regards psychic auras and dreamy states as psychologically determined, and his fugues in these cases are identical with post-epileptic automatism, even if they last over several days. We feel that his subject only slightly overlaps ours. The whole character and background of the cases is different. From an R.A.F. point of view, for instance, it is as difficult to deter an aircrew epileptic from flying as it is difficult to persuade an hysteric to fly.

DURATION OF THE SYMPTOM.

The duration of the symptom, as opposed to the length of amnesia claimed, may be brief if handled correctly, or may be prolonged over many years (2). This is subject to the gain achieved by persistence, the interest and sympathy aroused and the manner of handling by doctor and relatives.

Kanzer says that the amnesia never clears up when the patient is alone, and that as a rule the patient is found in a populous place. He was referring to hysterical loss of memory seen in peacetime—the usual variety. We have shown that sometimes a retrograde amnesia only commences when the patient is first spoken to. A defensive amnesia is usually a limited period in the past when first discovered.

Treated only by general care and observation memory may not return, or may come back in whole or in part, often in a dramatic way, perhaps a voice in a dream revealing the truth (19), or a tree or a face brings back a flood of memories. The same manner of recall has occurred under persuasion, an amnesic period often being kept back. Hopwood and Snell (16) reported that patients often remembered as the need for repression became less urgent.

In cases where memory has not returned in hospital but where the patient has been identified by relatives, Kanzer reports that such patients will go away freely with the claiming relatives, even although denying knowledge of them, saying, "I suppose it must be my husband," or some other phrase suitable to the occasion.

Treatment.

We have had almost uniform success in getting patients to face their memories by simple persuasion. In only four of our cases was an intravenous barbiturate employed, twice with a nursing sister present and twice without. Hospitalization is an advantage to simple persuasion. During the first interview the amnesia is played down by concentrating on the general life-story, and reassurance given as the interview ends that recall will be obtained at the next session. At this session one starts with the last thing remembered, and confidently persuades the patient to tell what happened in absolute chronological order. His attention is repeatedly forced back if he attempts to jump events or evade the issue with such remarks as "It must have been" or "I've been told." The patient's self esteem should be borne in mind. Usually recall is rapid, the majority in less than half-an-hour, but the physician must be prepared for a much longer interview.

The difficulties encountered are proportional to the duration of the amnesia as a symptom, and especially to failed attempts by others to obtain recall.

Case.—A youth, aged 16, collapsed after losing a long race on which he had set his heart. The race was run at about three on a Saturday afternoon. He was taken to the station hospital, and on admission was described as follows: "Could be roused by stimuli and firm requests; quasi-unconsciousness; behaviour strongly suggestive of emotional upset. N.S. normal." Four hours later he was weeping copiously. Reluctantly admitted he was all right, but complained of a complete amnesia covering a period from about 12.30 until the early evening. On the next day he was "unable to stand, complaining that the blood rushed from his head, patchy anaesthesia to pin-point and cotton-wool, no recall of amnesia."

During the next week he was seen two or three times by a specialist in neurology, but there was no recall of the amnesia and he was sent to Matlock. At the second interview the recall of the memory was undertaken. Between half-past three and four o'clock a very detailed account of his conduct between 12.30 on the Saturday, the far point of his retrograde amnesia, and 1.15 was obtained. There was much snapping of fingers and repeated "Ahs," as each trickle of memory came. Progress was so slow that he was given seven and a half grains of intravenous pentothal slowly over the next hour, but his highly circumstantial story could only be obtained up to 2.15 during that time. The injection was finished, but a complete block seemed to have been reached and no further recall was obtained during the next hour. At this stage the physician ordered coffee for himself, made up the fire and settled down comfortably. As he sipped the coffee he remarked, "There's plenty of time; just relax; it will come back if you think of anything that comes into your mind. Don't bother to make any effort." In a few minutes the patient snapped his fingers once more and the final details came rushing out, including the rising emotion as lap succeeded lap during the race, and he saw a good chance of victory dwindle to nothing while he suffered the agony of physical exhaustion, repeating to himself over and over again, "I can't go on; I'm finished; I can't go on." The whole story was complete before seven o'clock. In this case the patient was plainly and deliberately out-acted.

In the two cases of amnesia for the whole preceding life which we met simple persuasion was easily effective.

It is easy to wrap a cloak of mystery round this simple procedure. Sargant and Slater say they treat the patient as a whole, but think it essential to remove the amnesic gaps. We fully agree. They find their patients "often rather unsusceptible to direct hypnosis," and use intravenous barbiturate as the method of choice. They then sift the information, which is a mixture of truth and phantasy, and attempt an "emotional synthesis." Patients often confabulate, as Sargant and Slater suggest. We have the impression that phantasy is more often met with under hypnosis or narcosis than with simple persuasion. This tendency to romantic embellishment is not peculiar to psychogenic conditions, Russell (27) reporting it in organic amnesias following head injuries, and in such cases false accusations are sometimes made.

Our experience leaves us in no doubt that narcosis or hypnosis is rarely required. We consider such methods are better avoided, as they add importance to a symptom to which far too much attention is already paid, and also provide a peg on which

the patient can hang the recovery of his memory. We hold this view despite the widespread reliance placed on narcosis or hypnosis (4, 10, 13, 15, 17, 29, etc.).

If narcosis is used, sodium amytal or pentothal are commonly chosen, given very slowly intravenously. The narcotic is thought to reduce mental resistance, acting as a cortical depressant, and to have some unspecified action on the brain stem and autonomic centres. In our opinion the reduction of cortical control to the limited degree that still allows of an accurate recounting of past events must be slight, and we believe the value of narcosis lies in the suggestive value produced by the injection, the paraphernalia required, and the feeling experienced as the drug begins to take effect.

CASE.—An observer who ran away before an operational flight was given intravenous pentothal in the presence of a nursing sister of the R.A.F. He soon began to answer questions, described excessive drinking and then said "I had a woman" rather boldly, followed at once by a hurried "er—I met a girl," having one eye on the nursing sister and showing that his cortical faculties were very little impaired. The same patient confessed later that he could have recalled the whole story at any time. A week before the fugue he had bumped his head and been told by his M.O. that he had just missed concussion. This gave him the idea, and being frightened of flying he had solved his conflict in the manner that seemed best to him.

We have noted remarks like "I remember—with this of course," pointing to the needle in the arm, which indicates either suggestion or a process of guarding self-esteem.

Cardiazol injections (18, 22, 24, etc.) have been used to recall memories, so whatever specific aids lie in barbiturates are presumably shared by convulsants.

Gillespie (13) describes a case of recall under narcosis as a "physiologic process (narcosis) undoing a presumably psychologically produced inhibition." Our conception of the role of barbiturates forces us to reject this description completely.

THEORETICAL CONSIDERATIONS.

The dramatic qualities of hysterical symptoms and their miraculous cures have been constantly recurring themes for uninformed comment in the public press almost as long as popular journalism has existed, and there has been a complete failure or unwillingness to strip off the coverings of medieval magic from the histrionic hysteric. Of the hysteric's repertoire, "loss of memory" easily holds pride of place in the esteem of reporters and readers, and the kind of information displayed before a credulous public can be gauged by a few extracts from a typical article in a journal with a good reputation for providing reliable knowledge in a skilful and entertaining manner. It was headed "Amnesia—Civilian Shell Shock," and examples of amnesia were presented in hero and heroine style. It reported that 20,000 men and women in the U.S. experienced this symptom every year, that it lasts most often a few days, but may continue for years. Then, "When the amnesiac does remember his true identity, he forgets everything that happens during his seizure." It would be difficult to imagine a short sentence so full of arrant nonsense. It styles the symptom as a seizure, implying inevitability, and encourages the dangerous and erroneous belief that the recovered patient can never recall his acts during amnesia, thereby providing a ready-made defence for those acts. The loss of memory is described as a protective mechanism, usually not faked, and an authority from the New York Psychiatric Institute is quoted as saying, "Amnesia is as hard to simulate as a heart attack; the very real anxiety and sense of loss that a true amnesiac displays can't be feigned." A case of amnesia of eight years' duration cured by an operation on the brain, thus proving that the original loss of memory was due to head injury, was also quoted. These journalistic snippets of plain fact and embroidered fancy are a direct incitement to any impressionable and hard-pressed potential neurotic. "When the popular press reports one of them there is usually a small epidemic of them and I wonder whether some of them are feigned" wrote Ross (26). We have noticed an increasing tendency to use amnesia as a defence in criminal cases against charges of desertion, cruelty and so on. As a rule the dramatic picture of the distraught man wins valuable sympathy.

The problem of the mechanism of hysterical amnesia resolves itself into finding an explanation for a loss of memory which occurs at a moment suitable to the

patient, or at a time to draw attention to his unhappiness, and which he can be persuaded to remember without the artificial aid of drugs or hypnosis. It is a loss of memory during which his behaviour remains civilized and governed by elementary knowledge and rules acquired during his lifetime, even when the amnesia is retrograde for the whole life, during which he can travel, control himself in traffic, speak his own language, and generally make it quite obvious that any knowledge essential to his immediate comfort is retained. Since the loss of memory can be resolved the fault is clearly with recall.

Normal Remembering.

It is a truism that a tremendous amount of everyday observation is so lightly registered that for all practical purposes retention does not occur. The moving panorama of a busy street loses itself in the kaleidoscope of innumerable similar pictures; a familiar sweep of rural scenery hardly seems to show one autumn different from another, and there is a tremendous process of reduction into composite impressions. Only the unusual and the interesting are retained and available for recall. It is not fully realized that what is unusual and what is interesting are different for each observer, the consequence of a purely personal attitude and viewpoint.

Bartlett (3) said, "Remembering is the imaginative reconstruction or construction built out of the relation of our attitude towards a whole active mass of organized past reactions and experience." It is a personal recall made in the light of the individual's total experience at any moment and his immediate attitude to life. Of forgetting, Schilder says, "Apparent disturbances of memory and judgment are merely the expressions of emotional attitudes and are not due to a more or less fixed inability."

In general, excluding abnormal states of depression, memory favours the recaller. As Gillespie says, there is unwitting selection and accentuation as character and temperament develop. Distortion always exists, and is roughly proportional to the emotion which was aroused by the substance of what is remembered. Wexberg (33) wrote, "Every human being remembers what he needs and forgets the rest." Adult memories are largely interpreted in words, and a memory can best be expressed to others by verbalization. Gillespie points out that early experiences are in visual terms, a child remembering a large, globular, soft object giving pleasure and not a breast as such; a "biologic need is necessary to translate early impressions to present psychological concepts." Frequently in grown-ups there is an absence of verbalization descriptive of experience, and this is especially so with emotions at any stage of life. Like pain sensations, emotions are difficult to recapture.

Amnesia is the keystone of Freudian psychology, and psychoanalysis is the recall of memories which are hidden by a hypothetical force called repression, an unconscious force not recognized by the patient. The buried memory retains its emotional attributes and energy and is responsible for symptoms (11). Gillespie (13) describes a woman who remembered five objects easily. A box was substituted for one object and none could then be recalled. It was discovered that the box reminded the woman of a peculiarly unpleasant group of ideas of a closely personal sort and the unpleasant association produced an immediate forgetting, "the automatic operation of the superego" being the phrase used to describe this result. No distinction can be drawn between this and the sudden blocking of thought that develops in any adult who finds himself saying something which might reveal an action or opinion he is anxious to keep secret and to which shame might be attached, or the silent confusion of a child suddenly faced with a question or situation threatening to expose what had seemed safely hidden. On such occasions there is a sudden rush of emotion arising more from the immediate situation than from the buried thoughts, and until the sufferer has had time to balance the situation, an outwardly apparent paralysis of thought may continue.

It is difficult to draw a distinction, except one of degree, between a memory that is almost in consciousness but is threatening and distasteful, and a memory that is also threatening and distasteful but is so far from recall because of time, new memories, changing concepts and perpetual distortion that it is impossible to recall without special methods of treatment. Gillespie speaks of the "operation of the

ego itself " when an emotional content threatening self-preservation or some valued function, such as vision, may be unendurable " and repression results. He adds that " hysterical amnesia is something different." We suggest it may not be different, only simpler.

Everyday Forgetting.

We mention everyday forgetting here for completeness. There are two kinds at least. The first is based on a conflict of wishes when the less desired memory is usually ignored, the second occurs because of simple preoccupation with some other train of thought. We doubt if a concept such as repression is needed to explain either.

Recall has been divided into simple mechanical, or reflex, on the one hand, and recall involving voluntary effort, a higher function, on the other hand. We do not like this division. We prefer the first to be called impersonal recall, and include all memories of fact or opinion that do not involve personal and emotional considerations, whatever the degree of complexity resulting intellectual processes may reach. This is rare in a pure form, since the second variety of recall, the personal, is almost bound to intrude into any but the simplest memories, and introduce its special emotional colouring.

Preoccupation.

We regard preoccupation as a rather neglected factor in psychopathology. We divide it into intellectual and emotional preoccupation, as is usually done. Intellectual preoccupation is the use of impersonal recall in thinking and the name preoccupation merely serves to indicate that such thinking reduces the attention paid to extraneous sensations. A man drove his car for over an hour late one night along lonely country roads and through sleeping villages, over a route which was very well known to him. He was intellectually preoccupied with a problem, and on arriving at the gate leading to his garage he was suddenly faced with a demand for activity, opening the gate and the garage doors, which broke off his train of thought. At the same time he realized that he could not recall anything of his drive. He did not complain of this forgetting because he recalled his processes of thought and realized that preoccupation had reduced his attention to the passing scene and knew that had an accident threatened or a policeman given a signal he would have responded satisfactorily. In other words there was satisfactory registration of the facts of a situation from moment to moment, but no retention.

Emotional preoccupation produces the same effects as intellectual preoccupation in regard to noticing passing objects, but the mind is taken up with an absorbing emotion. Clearly a degree of emotional intensity cutting off external observation completely is almost a pure theoretical postulate; in practice preoccupation is a varying mixture of both, and one is reduced to the consideration of the havoc played with memory by emotional experiences. Frequently people have been accused of distortion and lying under such circumstances. When taking information from patients it is often impossible to differentiate lying from confabulation and confabulation from the truth. It will be convenient here to consider how emotional preoccupation may be linked with the development of hysterical amnesia.

Kanzer found an acute emotional disturbance preceding the symptom in 43 of his 71 amnesias, and in our own cases there was usually a rising tide of emotional distress and self-pity before the loss of memory developed. Taking a hypothetical service case, his emotion culminates in an absorption with the idea " I must get away, I can stand it no longer, I don't care if I die," and he leaves on his fugue. It is conceivable that he walks on heedless of the elements and his surroundings, and may cover several miles during some hours, until circumstances, such as the physical discomfort of cold and wet, or weakness or hunger or the intervention of someone who has noticed his distress force him back to immediate reality. His reverie ceases and he finds himself lost, with no recollection of the way he has come, nor can he give an account of his thoughts during his emotional preoccupation as can the man who experiences intellectual preoccupation, and this for several reasons. Firstly because his thoughts are personal and private, and concern matters he would not wish to discuss with a stranger, secondly because they are limited to a central idea, thirdly because they are chaotic about this idea, and fourthly because

emotion cannot easily be translated into words. As well as this he suddenly realizes his predicament and is suffused with shame. If he is familiar with the popular conception of "loss of memory," it is an easy step for him to say, "I can't remember anything; where am I?" Assuming this chain of events to be a reasonable possibility, it can only be a factor in an amnesia and fugue which is preceded by an acute emotional predicament, short in duration, with an amnesia extending only for the duration of the fugue and without any claim to loss of identity. In fact, even where confusion and anxiety are present and the patient looks ill and shows some physical evidence of prolonged anxiety, the resolved amnesia shows that observation was normal in most cases and may have been acute. Nevertheless, genuine emotional preoccupation is a factor sometimes, and due allowance should be made for it.

Fatigue.

In association with genuine emotional preoccupation as a facet of the structure of some cases of hysterical amnesia, the question of fatigue should be considered. Davies (7), in special tests with pilots in an experimental cockpit, found a tendency to diminution in the number of things to which a tiring man could pay attention. Indicators at the periphery of the control field especially tended to be neglected. The histories of pilots under difficulties and suffering from fatigue suggest that there is a gradual sacrifice of what appears to be less important. With a failing engine attention becomes eventually restricted to consideration of this mechanical defect. A soldier on a long route march may be alive with numerous interests at the start, be they concerned with the passing scene or with his natural grouses, but increasing fatigue gradually reduces the range of his thoughts and leaves him eventually preoccupied with one anxious idea, "I want to get back; I must get back." This is a comparable situation to the wearying psychoneurotic who is left with one obsessional idea, "I must get away."

It remains true, however, that genuine emotional preoccupation and fatigue are prominent in only a few cases.

Comparison with Children.

The running away of the adult hysteric is in every way similar to the running away of children, except when amnesia is present. Some adults have no amnesia, some start off without amnesia and some put their amnesia forward in a tentative manner. Otherwise both run away because of grievances and depression, both are pulled up by the same reason, a need for help and protection in their predicament, and both show confusion and anxiety expressive of their original emotion and of the shame attached to their immediate problem and surrender. In the adult a sharper realization of his position probably adds to the acuteness of apprehension, and he meets this situation by using the concept of amnesia with which he is familiar. The child does not complain of amnesia because he is unaware of such a possibility.

Another childish characteristic, which normally becomes increasingly under control as age advances, is a tendency to minor panic reactions with an apparent blocking of thought. These reactions are not communal responses to genuine danger, which may be more severe in adults, but the reactions of children caught in difficult circumstances which threaten their pride. Such a child may be dumb and unable to speak, or he may, because of his fear, whether justifiable or not, lie spontaneously—"I didn't, I didn't," or "I can't remember." Once the lie is told the child is prone to stick to his story, and needs gentle handling. Both the child and the hysteric are likely to become entangled in a web of phantasy of their own weaving. We believe this minor panic reaction is important, since many hysterical amnesias make it plain from their later revelations that they were perfectly aware of their own identity and situation right up to the moment when they were first questioned, and there may have been a sudden panic decision to take refuge in the phrase "I can't remember."

The Refusal to Remember.

Gillespie (13) states that the hysteric uses "a concept of forgetfulness as a symptom, as of paralysis or anaesthesia . . . depending on what has been read

and how he has been examined." If the reasons for the episode appear trivial and the whole adventure rather futile, this is because of the stunted emotional development of the hysteric. Gillespie adds, " He knows at least at the beginning that he is simulating but does not know why. He may realize that he wants sympathy." We are doubtful, however, whether the hysteric's ignorance of his reasons is often genuine; our cases of amnesia knew well from what they were running, and knew well what they would like done about it.

The ease with which most amnesic hysterics can be persuaded to remember without hypnosis or narcosis seems to us to be a vital point in understanding the mechanism of amnesia; memories are yielded up to patient persuasion by the physician. The hysteric does not forget, he only refuses to remember. As a patient said, " I realize that it was just that I didn't want to remember. I was excited and felt I wanted to do myself in or be alone and live my own way, away from everyone. I couldn't make friends."

An amnesic patient of Gillespie's failed to see him, although she saw everything else in the consulting room. This is a caricature in visual terms of the mental process of amnesia. We saw a colleague's patient being demonstrated to a gathering of doctors as a cured hysterical blindness. The patient had become annoyed by some petty restriction, and when asked to tell the doctors how he felt he peered round the room and said, " What doctors ? " Hysterical deafness is a simple form of the same refusal. The diagnosis of malingering is strongly suggested by such symptoms.

The amnesia occurs because the patient does not wish to remember. We cannot see the need for the conception of dissociation in considering this symptom. It is a striking fact that dramatic cases of so-called dissociation have not become more common despite a great increase in the number of psychoneuroses, diagnosed and described by a much larger number of trained observers.

The Total Picture.

In handling these cases the important considerations are those concerning the man's total personality and his ability to respond to difficulties in his environment. The refusal to remember is a superficial symptom, but it may be attached to a deep psychological disturbance. Culpin (6) recorded a case of a man cured of an hysterical symptom, who went off and committed suicide, and the symptom may occur in any form of mental disorder. This is no reason, however, for exaggerating the importance of the symptom itself.

The Fugues.

Sargant and Slater suggest " a specific constitutional tendency to fugues and other forms of disorders of consciousness." Brown (5) found that about 7 per cent. of hysterics showed possible direct heredity of hysterical reactions. How small this percentage would be if individual hysterical symptoms were considered we can only imagine. The opinion of Sargant and Slater can be viewed as an expression of belief that there is an essential difference between amnesia and hysterical paresis of a limb, but we have failed to find any psychological difference. We have seen no cases where parents have had fugues or amnesias, but hysterical symptoms so often imitate parental disabilities, psychogenic or not, that we would not be surprised if we met such cases. Hysterical symptoms are often built up on a genuine organic defect, of which mental disorder or a low intelligence quotient are examples, so the question of some minor organic defect being a constituent of the total picture of hysterical amnesia cannot be completely rejected.

Malingering.

Dillon and Masani (8) have shown how far a malingerer may go. We have had several cases where the claimed amnesia was an undiluted fabrication; the following is an example :

Case.—A member of a motor boat crew with an amnesia of six weeks' duration, in which he had wandered to many towns, stayed in numerous hotels, borrowed money from friends, and for one week had stayed at his fiancée's home. A well-educated, thoroughly spoilt young man, who was under-manager in the family business in which he had never done a stroke of work. He had his own car, which he used

exclusively for joy-riding, and was engaged to be married to a girl well liked by his people. He produced two counterfoils from hotels at which he had stayed near his home, and at which he had run up large bills, but the proprietors, knowing who he was and believing he was on leave, thought nothing of it. One week before the fugue started he had fallen down in the blackout and sustained a slight bruise on his head. X-ray was negative. The situation was discussed with him at some length and he was told that on the morrow the truth would be expected. The next day the story was unveiled. His fiancée had come down to see him and, having little work to do and being fed up, he decided to accompany her on her homeward journey in spite of her pleadings against this. On arriving at her home he realised what he had done, and being afraid to return to his unit he started to wander. At one period in the six weeks he even visited the town in which his unit was, determined to return, but his courage failed him at the last moment. In this case there was never the slightest doubt as to his ability to have told his story from the start, and this he admitted.

There is no clear distinction between hysteria and malingering in such cases. Gillespie says, referring to hysterical amnesias, " It is difficult to believe in most of them, perhaps in any of them, that memory was ever beyond the effort of voluntary recall." He adds that malingering is " difficult to differentiate from amnesia," that it is an attempt " to evade crude external difficulties of a contemporary kind of which he is perfectly well aware," and he suggests " that all the grosser symptomatic manifestations of hysteria are the joint manufacture of the patient and the too credulous physician, and that study of these gross symptoms has served only to obscure understanding of the underlying mental constitution." Wexberg states that " every hysterical attack lies on the borderline between psychoneurosis and simulation." When to these opinions one adds the statements of Kanzer, of Sargant and Slater, among many, that malingerers are constitutionally inadequate and their stories the product of severe psychopathic personalities, it may be wondered if any separate treatment is required for malingerers, as opposed to hysterics. We think they deserve separate notice because of their close relationship to ordinary hysteria. They represent a group where there can be no question of the ability to recall the lost memories if there is the will to do so, and in our view the refusal of the hysteric to reveal the truth is hardly to be distinguished.

None of Kanzer's patients confessed feigning, but Sargant and Slater found 9 of 32 patients with amnesia lying deliberately, and we found a higher proportion than that. Hysterics and malingerers have the child's selfishness; they assume the right to take what they can get without obligation. They develop emotionally conditioned beliefs in the rightness of their claim to sympathy or advancement, and are indifferent to the nature of their symptoms, which are merely means to a justifiable end.

A warning should be uttered about a too easy approach to malingerers. There is a present tendency to stress the frequency with which predisposition and psychopathy are discovered, and from that to argue that all malingerers are psychopaths. It is a small step from this to the statement that all liars for personal gain are excusable psychopaths—an ideal approach which can only be adopted as a practical guide under peril. Rymer (28) recently pointed out how often a defence of amnesia in the form of " everything went black " is made in murder trials, and gave his opinion that such temporary aberrations do not exist. Similarly we feel that an hysterical or malingered amnesia should never be a defence for any misdemeanour whatsoever. We would go further and say that since an amnesia provides proof of an attempt to deceive it should weigh against the culprit as a confession of guilt. This would not, of course, alter the consideration given to any mental imbalance or psychological disorder which might be found at the same time.

Conclusions.

1. The effects of organic factors should be estimated when considering amnesia.
2. Psychogenic amnesia is an hysterical symptom following emotion.
3. When a psychogenic amnesia is not complained of and is purely defensive against emotional anguish, the term " defensive amnesia " is suggested.
4. Predisposition and the hysterical constitution are basic precursors of amnesia.
5. Complicating fugues are considered.

6. Memory is divided into personal and impersonal recall, the latter including all memories of fact or opinion not involving personal or emotional considerations.

7. The possible importance of emotional preoccupation or fatigue in the genesis of the symptom is considered.

8. A comparison is made with child behaviour.

9. The hysteric does not forget, he refuses to remember. The process is active, as pointed out by Freud long ago.

10. The refusal is conscious or near conscious, and can be overcome by simple persuasion, which is the treatment of choice.

11. The importance of the symptom itself has been much overvalued. It is the total clinical picture that matters. The symptom can occur in serious mental disturbances.

12. The difference between hysterical amnesia and malingering is only one of degree.

13. Psychogenic amnesia should never be a defence for any misdemeanour whatsoever. It should weigh against the culprit as a confession of guilt, as an admission of the recognition of something he wishes to forget. In such cases due consideration should be given to any mental disturbance present.

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DISCUSSION.

Dr. W. SARGANT said that he had listened with very great interest to Squadron-Leader Parfitt's paper because he had always found many problems in this subject still unsolved. He really had only one criticism to make, and that was on the distribution of total amnesia. At Sutton they had seen a very large number of amnesic syndromes—over 250—and only a minority were of the relatively simple and superficial type which could approximate so closely to malingering. In the majority the aetiology and pathogenesis, especially in the patients who had undergone really severe physical and psychological stresses, seemed to be rather complex. As a result of his experience he would put forward some considerations of a more deterministic kind than were fashionable.

He agreed with Kraepelin's opinion that the hysteric was born and not made by his environment or of his own will. However much the pure endogenous depressive would welcome an attack of amnesia to relieve his troubles, he did not seem able to develop it even by subconscious means unless there was also a constitutional tendency to other hysterical traits in his personality. Pure anxiety states were similar; the patients did not seem able to obtain relief from their untold sufferings by genuine amnesia unless they had other hysterical traits in their make-up.

The most interesting material, and the bulk of cases, occurred at the time of Dunkirk, the Battle of Britain, and the bombing of London. It was very striking that in recent acute amnesias, occurring after great stress, the intravenous injection of sodium amytal was sometimes sufficient to bring a relief of the amnesia, and one did not need to say very much to the patients. They arrived at hospital with pallid faces, drawn features and trembling hands. As soon as amytal was injected, the breathing became easier, the face relaxed, the tremor stopped, and memory often came flooding back of its own accord. Return of memory would generally coincide with return of colour to their cheeks. It was as if changes in the autonomic system and brain metabolism produced by the amytal were all that was necessary.

Many patients were glad to have their memories back; they had struggled to get them back of their own accord, and the better the personality the more horrified they were at what had happened to them. One remembered, and was warned against, trying to find psychological motives for loss of memory in all cases by the fact that thought disorder in schizophrenia used to be considered by psychological theorists to be a motivated voluntary or unconscious withdrawal to phantasy life. They even tried to flog them to reverse this motivation.

It was known from talking to the insulin-treated patients that most were only too pleased to get rid of their thought disturbance and return to normal behaviour. There were, of course, other cases of functional amnesia who showed, as Parfitt had emphasized, almost conscious unwillingess to recall what had happened, and it had to be dragged out of them. Some hysterics who had long mastered the use of this symptom of their disease were obviously employing it for their own ends. He watched a few acute cases recover their memories suddenly and quite spontaneously while in hospital. In these, interestingly enough, return of memory sometimes coincided with a change from facial vasoconstriction and pallor to facial vasodilation producing a contrasting redness of the face which was very striking.

He wished to speak about a special small group of patients who had attacks of reversible amnesia, because they might provide a clue to the mechanism of this condition in a certain number of cases and to their proper treatment. He did not believe such people wished to have attacks either consciously or subconsciously; they happened, to their infinite distress and mortification. The reason they had them laid primarily in their heredity. There was a hysterical or unstable parent. The patients themselves had shown a constitutionally determined tendency to neurotic traits in early childhood, and might have been behaviour problem children. As they had grown up they had attained a reasonable social adaptation of a shallow sort. Their hysterical personality traits of bravado, shallow, rapidly changing affect, and exhibitionism might have won them a reputation as good fellows and mixers. Suddenly they were subjected to quite unaccustomed stresses, they experienced profound autonomic disturbances, their whole metabolism was upset, including the brain metabolism, they lost weight rapidly—sometimes up to 3 st.—and gradually or suddenly all the grosser hysterical qualities which were part of their constitutional endowment rose to the surface unchecked. Among other hysterical behaviour patterns displayed they might go quite spontaneously into hysterical amnesia for the first time. One learnt a lot about aetiology when trying to treat them even when, later on, the condition had become chronic and recurrent. He would mention one case which illustrated many of the points he had raised.

The man was a policeman at Dover. He had had ten years' service in the force, with no illness and a good record. He was happily married and sexually normal. He was very keen on his work, and though not very intelligent he was sociable, kind and friendly to everybody, and not the bullying type. He was of super-excellent physique. He said that his family history was normal and there was no neurotic disease. His father had only once been ill in his life. It was a mysterious illness. After long Petty Officer service he suddenly lost the use of his legs in Malta following fever and getting run down. He had been discharged from service and for a year or two could not walk. Then he was treated by a gipsy woman and regained use of his legs dramatically and for some years afterwards ran a successful business. That might be considered evidence of a constitutional tendency to hysteria in the family.

During the Dover raids the patient had done some first-class rescue work. He got little rest, as he had to be on duty whenever the siren went, and as his wife was evacuated he did not get regular meals. He started steadily losing weight. Finally he was blown through a doorway by a shell. He had gone on duty next night in a very shaky state. That night he had to deal with a mass shelter panic when the entrance was hit and he was inside with a large number of people. He did this and collapsed himself when it was all over. His attacks of amnesia started then. He would wake up and find himself when on duty in other parts of Dover. He was off duty for a time, and then went back, hiding his symptoms successfully for a time, but two years later he was sent to Sutton. He was discharged from the police, being told by his sergeant that he was a malingerer. He was having two or three attacks a day. In these attacks he would go blank, not recognize his wife or those around him. Often he imagined himself back in the shelter dealing with the mass panic hysteria or would act the part, lifting up floor boards, etc.

When normal he could recall these same painful experiences, but not what he did or said in his amnesic periods.

On admission this man was still over 2 st. below his normal weight. The significance of this had been overlooked by another psychiatrist. A variety of methods of bringing on attacks of dissociation in his deteriorated state were found. When shown a needle for taking blood his face blanched, he sweated slightly, his pulse altered and then, taking a few deep breaths he slipped into an attack. The same thing happened if a siren went. The attack could be rapidly stopped by restraining his breathing, which was generally deep and rapid in the attack. This combated the hyperventilation alkalosis and cerebral vasoconstriction, which he was maintaining by his overbreathing. If asked to hyperventilate voluntarily he also went into an attack, although it seemed to need more over-breathing than when he was excited. He would get an attack if he was asked to polish the floor or when he tried it of his own accord, because this, too, caused hyperventilation. If attacks were unchecked he would report gaps in his memory of up to half-an-hour when he could not recall what he had been doing. The EEG was normal and there was no question of epilepsy.

Abreaction did not work in this man's case, and other means of treatment had to be devised. The first thing to do was to improve his weight. He gained over a stone on modified insulin therapy and immediately he was better. His autonomic nervous system became less sensitive to outside stimuli, and he had to overbreathe more persistently because it had such catastrophic effects on his brain and behaviour. Autonomic disturbance was reduced still more by barbiturates and crataegus. Then he had to be taught to hold his breath when he felt excited. Gradually he began to control the attacks by attention to these physiological, rather than psychological, principles. At the same time it revealed to him the mechanism of the attack if he ever needed or wanted to use it to his own ends. But he showed no inclination that way; he wanted to get well. He had now been working for nearly a year in a factory. The attacks varied from one a week to one every three weeks, and they came on when he lifted heavy loads or became excited or tired. His wife was careful to see that his weight was kept up.

Dr. Sargant said he had seen other cases similar to this. One unfortunate soldier was discharged from a military hospital after having seen many psychiatrists and being told nothing more could be done for him. A reasonably good previous personality and army record, he had had a hysterical mother, and though initially lightly built had lost over two stone in the Abyssinian fighting before starting to develop attacks of functional loss of memory. He was now back in civil life with his deteriorated physical state quite untreated, and he was getting attacks of amnesia at his work when he had to climb two hills during the course of it, or when excited or over-tired. Before the war in the same job he had been excellent, but now he was on the point of giving up his whole career in despair.

The point Dr. Sargant wished to make was that the treatment of certain amnesic states, and speculations as to their aetiology, must take into consideration physiological alterations and constitutional weaknesses of brain metabolism as well as conscious and subconscious motivations. He ventured to suggest, in fact, that the cause and cure of hysteria in general, and with it some of the functional losses of memory, would finally become the province of the biochemist as well as of the psychotherapist and disciplinarian in a newer and better proportioned psychiatry.

Dr. PICKWORTH asked whether the cases described by Dr. Parfitt were in the same category as the short amnesias following severe injury, shock or blast in normal people. A Birmingham engineer had his arm torn off by some machinery; he remembered an urgent desire to get out of the place, but could not recollect the actual injury itself; abreaction was present as in the form of movements of the arm and legs as he recounted the story. Another case, with no obvious affective association, was that of a man who was in his house when the semi-detached neighbouring house was demolished and the roof blown off his own house by a bomb explosion. His first impression of the event was that of sand trickling on to his neck from the ceiling plaster. He insisted that he had no loss of memory, even of a short duration, but obviously did not recollect seeing or hearing the bomb explode nor the din that the scattering of debris must have caused. These two cases were understandable from the standpoint of physiogenesis as disturbances of the cerebral capillary patterns. If Dr. Parfitt's cases were of the same category they too might have had a similar physiogenesis, the cerebral vascular pattern necessary for the association of events being disrupted for a longer time.

Dr. STENGEL said that in commenting on and criticizing some of the statements made he did not want to minimize the merits of the paper. Some weeks ago he came across an article by Prof. D. K. Henderson written in 1918 on the same subject, and comparing the present paper with that article one had the impression that neither psychiatry nor psychopathology had made any progress during the last 25 years. It seemed that they could be satisfied with the statement that a phenomenal type of amnesia was entirely due to the desire to avoid unbearable situations. It was nearly 50 years since Breuer and Freud put forward their theory of repression which had been accepted by psychiatrists and the general public, and if truth was as old as that it was time that it ceased to make headlines. Not that it was not as true now as it was 50 years ago, but it was not the whole truth, and Freud was the first to be dissatisfied with that kind of explanation. It was very interesting that it was similar case material which forced him to

admit that the pleasure-pain principle was unsatisfactory, and it caused him to replace that theory by a more comprehensive theory.

Those were cases of dormant neurosis, and he wished to draw attention to an interesting fact that a person who was subjected to traumatic experience reacted either with refusal to remember or refusal to forget. Some of these cases arising from traumatic shock were not threatened with amnesia, but the opposite, and they were more difficult to treat because it seemed that they were losing the means of self-treatment which the amnesia patients had. It would be interesting to study those two groups under the same aspect.

Dr. Stengel wished to draw attention also to certain theoretical statements and submissions which seemed to be fairly well founded. It had been said that the amnesia was symbolic, and the same applied to the state of fugue. One could see very often that before the amnesia appeared the patient was preoccupied with the thought of death or even of suicide, and it seemed that the amnesias and fugues were symbolic substitutes for death—a fact to which Henderson, Wilson and others had drawn attention.

If psychiatrists did not confine their psychopathology to the earliest discoveries of psychoanalysts or to the later and equally important discoveries, they would know more about such phenomena and could approach the symptom from quite a different angle. In recent years psychopathology had attracted great attention, and it was really based on the fundamental discoveries of Jackson and Goldstein in New York, who had founded a pathology of neurotic reactions. He would say that these were patients who avoided catastrophic situations. In the speaker's view that conception of the catastrophic situation was quite speculative, but it was a new idea.

Dr. Sargant had pointed out other ways of approach which might lead to a deepening of their knowledge. Dr. Parfitt's attempting to differentiate between the hysteric and emotional type of amnesia was open to criticism, and he did not think that that differentiation was very useful, because it gave an impression that the hysterical patient was not an emotional case at the same time.

Dr. Stengel could not refrain from expressing his criticism regarding the vague manner in which the word "fugue" was being used not only by Dr. Parfitt but throughout the literature, because it led to a great deal of misunderstanding. He thought it would be unfortunate if hysterical amnesia and phenomena of a pathological type were put together and both called fugues as if they were the same phenomenon; a revision of the terminology would be necessary.

Dr. LINDSAY said that he had already called the attention of one of the speakers to the fact that a great deal of what had been said that day was seen in the daily life of mental defectives. There was no shadow of doubt that defectives suffered from amnesia of the same type; they suffered from it much more frequently than normal people and they were much more easily brought out of it.

His first case of that kind was 30 years ago. It was a soldier in the Black Watch who was not able to hear or to speak. He had been cured two days before by Dr. William Brown, but had all the symptoms when he arrived at the speaker's hospital within 48 hours. His commanding officer told him to send the patient to England, but he cured him too. He had seen in the paper that he would only be cured when he got back to his village in Scotland and saw his old grandmother—that other cases had been sent back and cured when they saw their grandmothers! A patient of his own of the mental age of four or five was sick in the ward and was later sent back to his work. The staff in the ward did not tell the workshop that he was coming back; he was missed and found ten miles from Caterham and came back quite quietly. Another case was that of a high-grade defective, who was out on daily employment. An S.O.S. was received from his employer that he had committed an indecent act in her garden. The patient said he did not know what he had done; again—he did not know whether his method was right—the patient was told, "If you tell me what you did you will get another chance; if you don't you must come back into the institution," and the patient told Dr. Lindsay what he did.

Col. PETRIE did not think they were talking of an entirely homogeneous set of cases. Some of these cases, at any rate those of commotional shock, were a little different from those in which merely a difficult situation had arisen. All sorts of variations of post-traumatic cases were thrown in with these hysterical amnesias. The group he had been seeing had been the unfortunate group of hysterical amnesias following absence without leave, and he recognized Dr. Parfitt's descriptions rather more than Dr. Sargant's amongst that particular group. Dr. Sargant had emphasized the hyperventilating, over-anxiety cases, and those symptoms undoubtedly did occur in the more acute cases. His general impression amongst the absent-without-leave men was that they might have a period of confusion about the time when they began to wander, but they clung to it long after it had cleared away in order to try to produce an impression of amnesia which perhaps made one call them malingerers rather than hysterics.

Squadron-Leader PARFITT, in reply, was glad that Dr. Lindsay and Col. Petrie had seen cases similar to those he had described, and he did not think he need say anything further in reply to them. Col. Petrie mentioned the commotional shock of the last war, and it would be a

pity to get tied up with the same problem again. One was tempted to deal with them in a physical way when the psychological method was insufficient.

Dr. Sargant had described a Dover policeman. This man had signs of autonomic disturbance which were extremely common in all kinds of psychoneuroses. One saw this disturbance in anxiety states, but one wondered whether the autonomic dysfunction was the cause of the amnesia which was being discussed. For that reason he was inclined to think that if the Dover policeman had been treated on purely psychological lines he might not now be having his one attack a week. There had been a preservation of the symptom, and it could become twice a week or three times a week if he were subjected to further psychological stress. He was not impressed with the theory that the autonomic change was a possible cause of amnesia.

Dr. Pickworth described rather a different thing when he mentioned the case of the man who had his arm torn off. That was not quite the subject about which he had been talking. When a person got an amnesic reaction he was rushing away from the scene of his pain; whether one could bring back the memory by persuasion or whether his shock was so great that it blotted out his ability to retain impressions he could not say.

Dr. Stengel made some criticisms which were mainly valid. His first was that the general trend of the paper was stated 48 years ago; this was perfectly right, and the only excuse for putting forward the paper was that the principles so often mentioned by Freud were forgotten. Dr. Stengel said he did not like the differentiation between emotional—or what he had called a protective amnesia, a defensive amnesia—and hysterical amnesia because it gave the impression that an amnesia was not hysterical. He was afraid he had not made himself clear; what he tried to say was that although the state in which the symptom occurred was different, the actual symptom was the same. Both types of cases were emotional and they were both reactions.

PSYCHOSURGERY: AN EVALUATION OF TWO HUNDRED CASES OVER SEVEN YEARS.

By WALTER FREEMAN, M.D., Ph.D., F.A.C.P., and JAMES W. WATTS, M.D., F.A.C.S.,

Washington, D.C.

From the Department of Neurology, George Washington University.

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PSYCHOSURGERY consists in surgical operation on the anatomically intact brain for the purpose of relieving mental symptoms. It was first devised and named by Egas Moniz, the distinguished Portuguese neurologist, essayist and diplomat, following the Third International Neurological Congress in 1935, at which time a remarkable symposium was offered on the functions of the frontal lobes (1). Approximately a year later Moniz (2) published his monograph detailing results in his first twenty cases. We began our work in the Fall of 1936, reporting our experiences in preliminary fashion several times, later bringing them together in a monograph (3), presenting the " results " in 80 cases. Since that time we have persistently followed up these cases as well as all subsequent ones, and now, with a series of 204 cases in all, we are able to discuss the adjustment of 154 living patients over a period ranging from six months to seven years.

Briefly, the operation is performed as follows: The surgeon marks lines on the shaven and sterilized scalp, locating approximately the coronal suture and the midline. On incising the scalp and retracting the soft tissues he finds the coronal suture and places a burr hole through it on each side, 6 cm. above the zygomatic process. He then opens the dura and takes " soundings," first passing a long ventricular needle or leucotome from one opening in the skull to the other through the genu of the corpus callosum. This gives the actual diameter of the brain at this point, which is a reliable guide to the avoidance of the anterior cerebral artery. The surgeon then probes downward in order to locate the sphenoidal ridge. Incisions behind this structure are attended with considerable risk of bleeding from short perforating arteries. Following the location of the sphenoidal ridge, the lines on the scalp are redrawn if necessary, so that the observer can guide the surgeon in the performance of the incisions in the selected plane. The surgeon then inserts a dull instrument like a paper-cutter (we use the Killian nasal septum periosteal elevator with a haemostat clamped to the shaft) into the track of the leucotome, and, under guidance by the observer, swings the blade through an arc, severing the subcortical white matter in one " quadrant " after another of each frontal lobe in the plane of the coronal suture. Since the observer can line up both knife and haemostat with the marks on the scalp, the incisions can be controlled with great precision. Following these sweeping incisions the surgeon sometimes extends them farther into the depths of the frontal lobe by means of radial stabs adjoining one another. This manoeuvre increases the number of white fibres severed, and has the additional advantage of displacing instead of cutting blood vessels on the mesial aspect of the hemisphere. Bleeding is usually minimal and is controlled by washing out the incisions with normal saline solution, after which a few drops of iodized oil are deposited in the extremities of the incisions in order to establish their position roentgenographically. In half the cases the operation can be carried out under local anaesthesia, in which case the observer obtains rather full notes upon the behaviour of the patient during the progress of operation. As the surgeon makes the final incisions the patient suddenly loses all his tension and anxiety and becomes disoriented. Pulse and blood pressure fall, the hands become warm and pink, sweating and vomiting occur. The operation is com-

pleted with the patient in a condition resembling sleep, from which he can be roused only by insistent questioning and shaking.

Recovery from the effects of operation is rapid. Some patients are scanning the newspapers and eating without assistance the following day. In those in whom a very extensive operation has been undertaken, however, a long period of sluggishness and disorientation supervenes with incontinence of bladder and bowel. The patient is encouraged to get out of bed within a week, and may travel in a fortnight. Disorientation and inertia disappear progressively, control of the sphincters is regained, and the patient emerges, equipped with a rather immature personality that proceeds to develop adult characteristics with more or less gratifying rapidity.

The ideas and behaviour that characterized the psychosis may persist for a long period after operation. Hallucinations, obsessions, compulsions, mannerisms and other durable symptoms die out only with the passage of time. However, the emotional nucleus of the psychosis is banished with the operation, and the other symptoms, since they lack the psychological *vis a tergo*, run on for a while of their own momentum and finally disappear.

Different patients require the severing of different amounts of frontal lobe fibres for relief from their mental disorder. Those showing more or less pure affective reactions respond to minimal interruptions, whereas individuals with long-standing obsessive neuroses or schizophrenia require maximal operations. Reoperations have been necessary in some 20 per cent. of our cases, some patients recovering from their distress only after a third operative procedure. Secondary operations are usually performed through new burr holes placed 1 or 1·5 cm. behind the coronal suture and 3·5 cm. lateral to the midline. The incisions into the white matter are made either parallel to the primary ones, or at an angle intersecting the primary ones at the level of the original burr holes. The performance of a secondary operation entails considerable risk of prolonged inertia, incontinence and general lack of adaptability, but may be necessary in order to terminate the persistent emotional response to the psychotic or neurotic ideas. Unless the operation is effective in extinguishing the emotional charge attached to these ideas, it will prove a failure. Relapses are just as resistant to ordinary treatment as are the original disorders, and we have not observed much benefit from shock therapy following unsuccessful operation. Secondary operation may be performed at any time after the original operation. If the roentgenograms show the incisions imperfectly placed, or if the patient fails to show the inertia and disorientation anticipated, reoperation may be performed within a few days. Otherwise it may be postponed until it is certain that no further improvement will occur, or in the event that a relapse occurs. The longest interval between operations in any of our cases has been five years. We are reluctant to admit failure in any given case until the emotional responses to the pathologic ideas are extinguished.

Once the emotional nucleus of the psychosis has been successfully abolished, the sting drawn, the reconstruction of the personality can be attempted. Sometimes this is simple and rapid; at other times so much of the frontal lobe has had to be sacrificed by operation that return to independent existence is difficult, prolonged and incomplete.

The two outstanding manifestations of patients for some weeks following prefrontal lobotomy are indolence and lack of tact. The inactivation of frontal lobe tissue permits these patients to indulge in various activities without waiting to see what the effects will be. The patients' responses are much more direct and immediate than they were before the illness commenced. There is apt to be a certain amount of euphoria, sometimes actual exuberance, with talkativeness, light-hearted laughter, quick repartee and petulance upon being thwarted. On the other hand, there is pronounced distractibility with poor concentration, improper timing, inability to keep a number of thought processes going simultaneously, and lack of zeal for perfection. These patients are reduced by operation to a state of emotional childishness. Fortunately in all instances there is progressive reorganization of behaviour in the weeks that follow operation, so that in due time more than half of the patients can resume some productive activity. Improvement continues over a period of months and even years. Some of our patients are advancing in their social adaptability at the end of three or even five years. Indeed, the relatives of some patients declare that the patients are more productive and better balanced than they ever were, even before the development of the illness.

Failures can be traced to several different causes. In the first place, the incisions may be placed too far anterior to produce the bleaching of the emotional responses to the self-directed ideas. Secondly, the lesions may be placed too far posterior in an effort to eradicate the emotional charge, and result in depriving the patient of the ability to control himself adequately in a social situation. Thirdly, the patient may have undergone deterioration to the point where the emotional responses have more or less died out, and consequently further suppression of the emotional responses produces no demonstrable change. A deteriorated schizophrenic looks and acts about the same with or without his frontal lobes.

Success can be anticipated in cases submitted to psychosurgery almost in proportion to the manifestations of emotional tension. Thus a patient with agitated depression or chronic anxiety is the ideal candidate for operation. Patients with obsessive ruminative tension states and obsessive compulsive trends can be relieved in large measure, although their behaviour is apt to be rather disagreeable when their internal conflicts are resolved. Their aggressions appear to be redirected in an outward direction, with consequent discomforting results to those who care for them. Nevertheless, these patients usually return to a productive existence, since they have in large measure both intelligence and energy drive. Once these can be harnessed the results are apt to be very satisfactory. Middle-aged patients with depressions of various sorts, hypochondriacal complaints, insomnia, and so on, are favourably influenced in a large majority of instances, but oftentimes, through age and illness, they have slipped from their positions of responsibility, their families have " closed ranks," and these patients remain at home, comfortable but unproductive. Schizophrenics at times have gratified us by their excellent adjustment, but at other times their adjustment has been disappointing. Not infrequently the symptoms, such as hallucinations and delusions, persist for months or even years, but they no longer occupy the patient's attention to the exclusion of external happenings, and the patients can resume their productive work no longer distressed by their ideas. Nevertheless, they are a dreamy lot as a whole. They do not reach out toward new goals, but are content with modest activities. Quite frequently they remain at home, content with their status of domestic pets—a condition often appreciated by their overprotective relatives. Of all the types of cases with which we have had experience, the chronic alcoholics are the least satisfactory. We believe it is because of the persistence of the socially acceptable compulsion to " bend the elbow " even after the need for such activity has, by their own admission, ceased to exist.

Table I gives the present status of 154 living patients after an interval of six months to seven years following prefrontal lobotomy; 34 patients have been operated upon too recently for proper evaluation, while 16 have died—4 from operation, 2 from suicide, and the other 10 from natural causes. It will be observed that 61 per cent. of the patients are usefully occupied, whereas only 12 per cent. are necessarily confined in institutions. These figures include our early cases when less extensive operations were being performed, with lower recovery rates, but they also include many patients who had not reached the stage of institutional existence. It is not beyond the bounds of possibility that similar results could be obtained in working with purely institutional material.

TABLE I.—*Status of Living Patients Six Months to Seven Years after Lobotomy.*

Disease.	Number.	Percentages. Regularly employed.	Partly employed.	Keeping house.	At home.	Institution.
Involutional depressions	65	11	6	42	32	9
Schizophrenias	43	26	5	23	32	14
Obsessive tension states	30	47	10	20	17	6
Psychoneuroses	10	50	—	20	10	20
Undifferentiated (schizoid)	6	33	—	17	17	33
Totals	154	25	6	30	27	12

Table II gives our estimate of the results in terms of relief of symptoms and subsequent social adaptability. If a patient's behaviour is so erratic as to prove almost intolerable to relatives, the operation cannot be considered a success, even

though the patient is satisfied. We would consider him too satisfied, too thoroughly relieved of appreciation of his responsibilities. Our estimate of improvement is also coloured by the behaviour of the patient before and after operation. The result is considered good if a schizophrenic is able to live at home in idleness after being in a chronically excited, assaultive and resistive state in a mental hospital. On the other hand, an anxiety neurotic, even though able to maintain his employment after operation, is considered to show a mediocre result if his behaviour is too distressing to his relatives.

TABLE II.—*Results of Prefrontal Lobotomy. Excluding* 34 *Recent Cases. Percentages.*

Disease.	Number.	Results.			Deaths.	
		Good.	Fair.	Poor.	Operative.	Subsequent.
Involutional depressions	77	67	21	8	4	11
Schizophrenias	45	64	15	19	2	2
Obsessive tension states	31	71	23	6	—	3
Psychoneuroses	10	60	20	20	—	—
Undifferentiated (schizoid)	7	14	43	43	—	14
Totals	170	65	21	12	2	7

Patients who have died long after operation have given us the opportunity to determine what cerebral structures undergo changes following prefrontal lobotomy. Study of eight brains has shown that the cortical incisions are small and destroy few cells. The subcortical lesions are clean irregular cysts, with smooth shiny walls, sometimes communicating with the ventricles. There is no detectable change in the architecture of the cortex at the frontal pole, although there is some general shrinkage as determined during life by pneumo-encephalography. There is no degeneration of myelin sheaths visible in the internal capsule or peduncle. There are some degenerated fibres (Marchi) anterior to the lesions, particularly in the upper quadrant. The most striking alteration is the severe degeneration of the nucleus medialis dorsalis of the thalamus. Here the cells in the lateral portion of the nucleus have undergone a reduction of 75 per cent. or more with some shrinkage of the nucleus as a whole, and a little reactive gliosis. The pathologic findings indicate that the thalamofrontal radiation has been fairly completely severed, since Walker (4) has shown that this pathway constitutes the projection system from the thalamus to the frontal lobe. Whether this is the only pathway of importance in the operation of prefrontal lobotomy has not been determined, since rather restricted incisions aimed at the fasciculus cinguli have also produced striking alterations in the patients' behaviour, but more particularly along the lines of autonomic alterations.

Throughout this paper we have emphasized the importance of the emotional changes as the result of prefrontal lobotomy. We are led to believe that the operation succeeds by reducing the impact of the psychotic ideas upon the sick individual. Prefrontal lobotomy bleaches the affect attached to the ego. Following operation there is still retained the capacity to introspect, but to a limited degree. Furthermore, the emotions, far from being blunted, are lively, less restrained and more evanescent and changeable. They are, however, no longer attached to the image of the self that is projected into the future. The severing of the thalamofrontal pathway, we believe, prevents the individual from maintaining his obsessive preoccupation with his self-directed ideas. As far as we can determine there is no falling off in the mental acuity of the average individual operated upon, since problems are solved as in the psychometric tests with equal or even greater facility than before operation. Some reduction in speed is observed during the first month or so after operation, but accuracy is generally greater. However, should problems of considerable complexity be presented to a patient after operation it may be noted that he fails. We suspect that this is due to inadequate motivation rather than to impaired intellectual acuity. Protracted thought, diligence and studiousness are seldom observed in such people. Patients no longer have to reassure themselves against their own feelings of inferiority by exerting themselves intellectually. Nevertheless, some individuals have produced sur-

prisingly painstaking pieces of work, showing considerable imagination, creative capacity, diligence and persistence.

We have attributed to the frontal lobes the capacity to foresee, to anticipate, to see what ought to be done. We have linked this with consciousness of the self by the self, making it a very personal matter as regards the future. In other words, a patient may find no difficulty in planning for the future as far as impersonal objective situations are concerned. However, where personal details are concerned, the patient is apt to react on an immature basis, lacking in self-consciousness. The classic example, in our experience, was an inventor and tool designer who described for a medical audience at our request the intricacies of an apparatus of his invention, and followed this by discoursing upon non-heat-producing foods, spiritualism, and naturopathy that he claimed were really responsible for his cure. He was completely unembarrassed by the laughter he provoked, and probably had no realization of his lack of diplomacy. In another instance a man said of his wife, " Whatever pops into her head comes out of her mouth."

We have further theorized upon the functions of the frontal lobes, emphasizing their importance in the relationships of the self with the self not only at the social level but also at the visceral level. The operation of prefrontal lobotomy makes introspection difficult, time-consuming and emotionally unsatisfying—" not worth the trouble." Yet it can be done, if the patient is sufficiently pressed by the questioner. At the same time the patient loses interest in the performance of his heart, stomach, bowels and so on. Patients mention frequency of urination as one of the sequels of operation, but they are not emotionally distressed by it. More often this frequency is mentioned by relatives. In one case a vesical calculus, the size of a hen's egg, developed in a man some years after prefrontal lobotomy, and excited so little complaint that it was only when the wife noted haematuria that he was brought to operation. His recovery was extremely rapid and he never complained of pain. Some patients with hypochondriacal complaints before operation persist in mentioning them for a long period, but the complaints are lacking in insistence. We speak of echo symptoms.

Self-observation, studying of symptoms and signs, tender contemplation of this and that organ, with anxious appraisal of the future, the building up of a series of ghastly consequences centring around, say, a little pylorospasm or a few extrasystoles, is no longer productive of emotional satisfaction in these patients. And, by the same token, when the emotional component is removed there is apt to be smoother and more harmonious functioning of the viscera. We have even noted a gradual decline in the level of rather severe and persistent arterial hypertension over a period of several years.

Above all, it is in social situations that these patients manifest a change from their previous condition. While they are able to maintain a satisfactory and dignified attitude among strangers, they give way to their rather puerile impulses in the family medium. They laugh easily and flare up in anger, but there is none of the brooding intensity that characterized the psychosis preoperatively. They are apparently careless rather than unaware of the impression they are about to convey to others concerning themselves. They lack self-consciousness, sometimes to a degree that is embarrassing to their relatives.

The reduction in the consciousness of the self applies also to the self as a collection of organs. Visceral complaints are forgotten. One of the commonest sequelae of prefrontal lobotomy is pronounced gain in weight, due to a healthy appetite and a sound digestion. Naturally industrious persons are oblivious to fatigue, and preoccupation with somatic sensations is lost. Patients seem to lose interest in themselves and in their own reactions and their interests are directed outward.

It would seem, therefore, that prefrontal lobotomy abolishes many of the symptoms of mental disorder by bleaching the affect attached to the ego. Symptoms such as anxiety, worry, apprehension, obsessive thinking and the like are prominent in most of the psychoses at least during their inception. These symptoms have an egocentric signature. The threat to the security and integrity of the individual is all the greater as the importance of the individual is magnified by himself. By reducing the emotion expended upon the ideas relating to the self, prefrontal lobotomy reduces the significance of the self to the self and tends to abolish egocentricity.

It is good to have a little concern over the future, a certain self-consciousness,

some ability to contemplate and to speculate, and to foresee the results of one's actions, for these are among the most distinctively human traits. But when concern over the future leads to indecision and blocking of action; when painful self-consciousness leads to apprehension and delusions of persecution; when perverted foresight raises up impenetrable barriers to happiness; and when, in contemplation, thoughts come into consciousness with the intensity of sound, then prefrontal lobotomy may provide a constructive mode of relief.

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A CASE OF NARCOLEPSY WITH ONEIRIC MANIFESTATIONS.

By DIOGO FURTADO,

Professor of Neurology and Psychiatry of the Faculty of Medicine, Lisbon; Honorary Member of the Royal Society of Medicine; and

F. E. PULIDO VALENTE,

House Physician in the State Hospitals, Lisbon.

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THE observation of cases of narcolepsy does not to-day constitute a rarity worthy of notice. There are references in the literature to some hundreds of these cases, and we ourselves possess several observations which do not differ from the type described in monographs and text-books. However, in recent months there has come to our notice a case which presents rather peculiar characteristics. The truly remarkable amount of detail in the clinical picture, the rapid evolution of the disease, its combination with a syndrome of very marked oneiric manifestations at night, make the case in question worthy of note.

Further, it was possible to analyse the course the of paroxysmal phenomena by means of cinematography, and we even made an attempt to study the action of drugs whose effect has recently been discussed with regard to the affection.

All these facts give us occasion to make a concise revision of the question of the narcolepsies and of their relations with the problem of sleep. The designation "narcolepsy" was originally given by Gelineau (1880), and was attributed by him, in his own words, to "a rare neurosis . . . characterized by an imperative desire to sleep, sudden but of short duration, repeating itself at intervals." Earlier cases, as those of Willis ("pathological sleep," 1677), of Fournier ("pernicious sleep," 1813), of Bright (1813), give us no guarantee that the disturbance of sleep which they presented really belonged to the condition with which we are dealing.

There has been much discussion about this new morbid state, ever since the simple description by the French author. This discussion has principally been concerned with—

(*a*) Its classification either as a separate entity, or merely resulting from the conjunction of diverse causes, many already known.

(*b*) The nomenclature attributed to the syndrome itself, or to the phenomena which constitute it.

(*c*) And finally its relationship to epilepsy on the one hand and natural sleep on the other.

The number of cases of narcolepsy has grown considerably in the last 20 years, and this increase appears to be not unrelated with the spread of epidemic encephalitis following the last war. As in the case of epilepsy, there appeared a series of causes which favoured the evolution of the morbid complex of narcolepsy.

We shall have occasion later on to study these causes in greater detail. But beside this undoubtedly large group of narcoleptic syndromes of known etiology, there remains another even greater group in which the whole illness consists of the clinical complex of narcolepsy without any discoverable cause or characteristic anatomical picture. It is principally to these syndromes, which we may call essential narcolepsy, by analogy with epilepsy, that the following clinical summary refers. Contrary to what Gelineau described, it is known to-day that the picture of narcolepsy is not exclusively made up of sleepiness. Since Loewenfeld (1902) and later Henneberg (1915) there has been added to it another type of crisis, alternating with the others, and called by the latter author cataplectic crisis or cataplexy. Thus narcoleptic and cataplectic crises constitute the nucleus of the syndrome, to which other manifestations may be added. It should be noted, however, that Gelineau, besides referring to the sleep crisis, also spoke of the patients' falls or

astasias, a phenomenon probably corresponding to the new type of crisis described by Henneberg.

The narcoleptic attack, or attack of sleep, begins abruptly. A certain number of causes may favour its onset. Perhaps the most frequent is the fact of the patient sitting, or working sitting down, at a monotonous occupation. Besides this, other circumstances which normally favour sleepiness, such as " after meals," a warm atmosphere, after coitus, frequently provoke the advent of a crisis. At other times there are causes whose influence appears paradoxical: conversation, riding, driving a car, the beginning of coitus, professional activity, the emotional state produced by bombing, etc. A certain number of patients fall to the ground at the onset of the crisis. In one soldier whom we had occasion to observe recently, these falls caused various traumatic lesions. In some patients the attack passes with the patient sleeping standing up; the sleep is then similar to that described by Rosenthal in exhausted soldiers who continue marching (*corticalen Übermüdungschlaf*), the consciousness alone being asleep while the muscular tone is maintained active and equilibrating.

The majority of patients, however, have time to sit or lie down, and thus find a position comfortable for sleep. Sometimes the sleep is heralded by various phenomena—repeated yawning, feeling of acute fatigue, paraesthesiae. At other times there is no prodromal sign before the first manifestations of sleep.

The sleep of the narcoleptic, in the opinion of the most experienced authors (Adie, Redlich, Murphy, etc.) and our own, does not differ from normal sleep. Wilson, however, strenuously contests this point, and the controversy aroused about his opinion leads us to analyse the characteristics of narcoleptic sleep in more detail.

The patient's face becomes slightly congested, its expression is lost and its tone diminishes. The breathing becomes slower and deeper than in the waking state; there is also a certain slowing down of the cardiac rhythm and a moderate fall of arterial tension. The pupils, which are difficult to investigate, generally appear small, dilating when the patient wakes up. In one case of Strauss' there was no reaction to light; this passed off on waking. The sleep is not generally very deep, and it is almost always possible to wake the patient. In some cases the existence of a certain amount of consciousness during the attack has been affirmed, the patients hear and are able to remember what is said to them, but do not move or answer and give the impression of being asleep (Redlich, Guleke, Fisher, Loewenfeld). Such cases are exceptional; in the majority, as we shall presently describe, the state of consciousness is that of normal sleep.

Some patients have dreams during the attacks, dreams which are no more than those which occur in their normal sleep. In yet other very rare cases, hypnagogic hallucinations have been noted.

The awakening of the patients is generally marked by reactionary movements; the patient tries to lift his head, move his arms or open his eyes, but these movements are opposed by the lack of tone and for this reason are repeated and incomplete. This phenomenon of lack of tone on waking from a crisis, described by Weir Mitchell and by Wilson, belongs to the manifestations of dissociation of the constituent elements of sleep which will concern us later on.

The crises are repeated during the day a variable number of times, from one crisis every ten minutes or every time the patient sits down to one or two per day. Their duration also varies from seconds to many hours (12 in Redlich's case, and 36 in Noak's).

The problem to be discussed here, and one of great interest in regard to the pathology of the syndrome, is that of the relation of narcoleptic to normal sleep. As we have said, the majority of authors consider the two phenomena as analogous. Kinnier Wilson, however, advocated its clear differentiation. His principal arguments are as follows: In some patients there is sleep with persistence of partial consciousness (the cases already cited); the attacks are not preceded by somnolence or the feeling of the necessity for sleep, as in normal sleep; sometimes the crises of narcolepsy are provoked by an emotion, which is never the case with sleep; its onset is generally abrupt; after a crisis the awakening is also sudden—contrary to what happens in normal sleep; lastly, Wilson maintains that there is a complete independence of narcolepsy from the nocturnal sleep of the patient, the latter being normal in narcoleptics.

Nielsen, in his recent treatise on neurology, corroborates the opinion of Wilson, considering the sleep of narcoleptics different from physiological sleep and more nearly approximating to the state of coma.

The majority of Wilson's arguments are, however, refuted, as can be deduced from our description, from the study of consciousness chiefly after the work of that author.

The precursors of sleep, just as the gradual awakening, constitute the fact of the narcoleptic crises, as in normal sleep; the cases of narcolepsy with partial persistence of consciousness, in the same way as those provoked by emotion, are marked exceptions. Only the sudden onset, the immediate and imperative necessary for sleep, distinguish the two phenomena.

Wilson's last argument, the normal nature of nocturnal sleep of narcoleptics, requires a few words.

Contrary to what the great English neurologist affirmed, to-day it may be considered that in the greater number of cases the nocturnal sleep of narcoleptics is *not* normal.

Most patients (Redlich, Notkin and Jelliffe) have disturbed sleep, with much movement, constantly turning over. In many of them somnambulism occurs, and attacks of anxiety of the nature of night-terrors. Both Rosenthal and Bonhoeffer think that there is in these cases a dissociation of the sleep mechanism, the cortical function being less paralysed than the subcortical. The phenomenon, to which we have already referred, of lack of tone after waking from the attacks, giving rise to reactionary movements, incomplete and repeated, also occur with a certain frequency, after the nocturnal sleep of narcoleptics, and have been accepted as a proof of the functional dissociation of the elements of sleep.

Some patients wake abruptly from their nocturnal sleep, while in others confusional states following sleep, or states of sleepy intoxication, have been described (Jelliffe).

From the facts given it can be deduced therefore that the nocturnal sleep of narcoleptics is not normal, and that it is impossible to observe an essential difference in these patients between the pathological sleep of the crises and spontaneous nocturnal sleep. From the clinical aspect the sleep of narcoleptic attacks is, in the main, analogous to physiological sleep, and in one or other detail in which it differs from it, it differs equally from the nocturnal sleep of the same patients, also pathologically modified in many cases.

In recent years two new arguments of an experimental nature have helped to establish this idea, already held by most clinicians, of the identical nature of sleep of narcoleptics and physiological sleep; we refer to the pharmacological action of sympatheticomimetic compounds, similar to adrenaline, and to the curve of the electroencephalogram.

The favourable effect of ephedrine, benzedrine and similar substances upon narcolepsy was first discovered by Janota and Skala, in Czechoslavakia, and by Doyle in America in 1930. As is known, the basis of these is sympathetic stimulation, identical with that of adrenaline, but further endowed with a specific action on the superior nervous centres and the psychic region (stimulant action, causing euphoria and the inhibition of fatigue), which adrenaline does not possess. During the period of administration of these drugs, the narcoleptic attacks disappear completely. Further, many of the patients improve and are even cured, which state is maintained after the treatment is stopped. The effect of such drugs, as we shall see in connection with our case, is clear and almost constant.

Of course, these substances have a strong antisomnolent action. It is well known that the administration of ephedrine and its synthetic derivatives (benzedrine, pervitin) at night retard and even prevent sleep; and that on the contrary, its administration in the morning, producing the characteristic psychic and sympathetic excitement during the day, facilitates a compensatory sleep the following night. This group of drugs, specific in producing the state of wakefulness, therefore acts equally on physiological sleep and on narcolepsy, which is an incontrovertible argument in favour of the identical nature, or close relation of these two states.

Even more important is the argument derived from electroencephalographic studies. Since the work of Davis, Roomès, Hartry and Hobbart, the electroencephalographic tracings of normal sleep are well known, and so characteristic and unmistakable are they that they can be easily recognized.

Dynes and Finley studied the findings of the electroencephalogram in cases of narcolepsy, and verified that in 17 patients, in which the disease took a primitive form, that is, it did not have a distinct etiology and was not accompanied by permanent organic symptoms, the tracings taken during the attacks were absolutely identical with those of physiological sleep, and the various electroencephalographic phases followed each other in the same manner and in the same rhythm (as the latter). In only 5 cases in which the narcolepsy was accompanied by organic neurological symptoms and was consequent on an affection of the central nervous system did the electroencephalographic tracings present anomalous appearances.

From all this analysis of narcoleptic attacks we can, therefore, deduce the conclusion that the sleep occurring in them is analogous to normal sleep, and that the basis of the disease is merely a disordered regulation or perhaps a facilitation of the normal mechanisms of sleep. This conclusion seems to us to be of great importance in the pathology of the disease.

The second type of attack which exists in narcolepsy consists of the cataplectic crises. It is the phenomenon which was described by Gélineau under the name "astasia," by Lowenfeld as *Kataplektische Starre*, by Henneberg as *Kataplektische Hemmung*, and by Redlich as *Affektiver Tonusverlust*.

These attacks are associated with narcolepsy in 72 per cent. of cases. They are characterized by loss of muscular tone provoked by emotional states. Generally, as happens in our case, laughter provokes the attacks; at other times emotions, or even the mere memory of an emotion which has previously caused an attack will bring on another (Sommer).

Some cases have spontaneous attacks of cataplexy without any exciting cause. These cases are in opposition to those already referred to in which the emotional cause provokes not only cataplexy, but also sleep attacks. There are, therefore, cases in which there exists such an intimate dependence of the emotional state on the attack that it causes narcolepsy; side by side with others in which this dependence does not exist, not even for cataplexy.

The relation of cataplexy to laughter constitutes an exaggeration, so to speak, of a physiological phenomenon; the manifestations of hypotonia, both of the voluntary and involuntary musculature which follow attacks of laughter, are well known, being expressed in various languages by phrases such as "to be helpless with laughter," "to die of laughter," etc. Crushmann and Prange stress this phenomenon, considering that the hypotonia of the disease is a usual form of reaction to emotion. The relaxation of the vesical, and even rectal sphincter is also frequently observed in such circumstances.

The description of the crises is well known. Between the emotion and the cataplexy there are sometimes certain prodromal symptoms: the patient feels throbbing in his head, and a diffused warmth, or breathlessness. At other times, immediately following on the laughter and as it grows more intense, he progressively loses tone. Generally, hypotonus of the extensors precedes that of the flexors; the head drops, the trunk becomes flexed, the arms hang down and the patient finally falls. Owing to the lack of tone his fall is very characteristic, the complete lack of attitude resembling that of a partly stuffed sawdust doll. As he does not fall immediately and the loss of tone is not simultaneous in all groups of muscles, the patient tries to balance himself by making repeated reactionary movements; their abrupt appearance, jerkiness and incompleteness have led some authors to take them for epileptic contractions, or choreic movements. In reality they are simply voluntary reactionary movements to which the special distribution of lack of tone gives an unusual appearance. Generally they are movements of lifting the head or arms, attempts to lift the trunk, movements of pronation and supination of the hands, or mimicking movements of the face.

In some acute forms of cataplexy there are incontinence of urine, paraesthesiae in the limbs and, at times, difficulty in breathing. Congestion of the face is frequent; in certain observations fever was noted during the attack.

The neurological examination has repeatedly been made during the cataplectic state, but the results are of little interest. Villaverde (quoted by Redlich), Wilson and Mankowsky note loss of tendon reflexes, but in the majority of cases only a more or less pronounced diminution is found.

The pupils react normally to light; the conjunctival reflexes may be abolished. In isolated cases the plantar responses may be extensor (Wilson). In general,

although they exist together in the same patient, the narcoleptic attacks are independent of those of cataplexy. Between them there are, however, all forms of transition and association, the pathological interest of which it is useful to stress.

Thus there exist:

(1) The typical cases (72 per cent., according to Redlich), in which the narcoleptic attacks alternate with cataplexy, though the former may be more frequent than the latter.

(2) Cases in which there are only the narcoleptic attacks; these are quite common, especially (as also happens in the following group) among the symptomatic types.

(3) Cases in which there are only cataplectic attacks (Sommer, Berliner, Hoff and Schilder, etc.).

(4) Cases in which the patients present, at different times, the two types of attacks (Symonds, Hilpert, Sperling and Wimmer, etc.).

(5) Cases in which the crises are associated, the somnolence following immediately upon the cataplexy, or vice versa.

(6) Cases in which the symptomatology make it possible to affirm that the attacks result from the association of both types of disturbance (cataplexy with serious disturbance of consciousness, sleep with marked loss of tone, which is dissociated chronologically, appearing before or after the attacks)..

This series of intermediate forms allows us to establish an intimate relation between narcolepsy and cataplexy, both undoubtedly originating in one mechanism.

The rest of the symptomatology is slight, the mental symptoms alone being worthy of a more detailed reference.

Thus in some patients endocrine symptoms have been met with.

Above all there exists a marked tendency to obesity, as in Dickens's "fat boy" who used to go to sleep with the food in his mouth. A considerable number of narcoleptics present a certain degree of obesity; nevertheless, severe endocrine obesity, of the type of Frölich or other, is not met in these cases.

Posterior pituitary symptoms are otherwise rare, even in the cases following on encephalitis; patients with polyuria or thermic alterations are exceptional. The radiological picture shows in almost all cases a small sella turcica. In some observations the co-existence of simple goitre has been noticed. In one single case the narcoleptic attacks began after a thyroidectomy.

There have also been noted cases with genital dystrophy, some even with genital infantilism, but these associations are far from frequent. In women, where the disease is much more rare than in men (1 : 6 according to Wilson, 1 : 4 according to Redlich), some instances have been noted in which the narcoleptic crises coincided with the menstrual period (Fisher, Ballet). More noteworthy is its relative frequency during pregnancy—a fact which the majority of authors mention. The blood picture in many cases shows modifications which various authors have noted. These modifications consist of a lymphocytosis (from 34 per cent. to 53 per cent. according to Redlich), with some eosinophilia (about 7–10 per cent.). Wilson tends to attribute these modifications to the thymo-lymphatic state, frequently present in these patients.

Lumbar puncture has been performed in many patients, without any pathological findings in the fluid. Rathner alone mentions raised pressure in one case. Lhermitte saw one case cured after lumbar puncture—a phenomenon which has not been observed again.

In the analysis of the mental symptoms of narcoleptics we must distinguish between the constitutional psychical disturbances, or those co-existent with narcolepsy, and the symptomatology really due to the disease. Thus, one meets descriptions of a certain number of oligophrenics (two cases of Redlich, one of Noak, one of Boas, etc.). In another of Redlich's cases he speaks of a boy whose obsession was to discover perpetual motion. In at least two cases the patients ended by committing suicide. In the cases of Edees and Henneberg the patients were schizophrenics, and one of Redlich's suffered from periodic melancholia.

Some types following on epidemic encephalitis show signs of post-encephalitic psychopathy. In all these cases we are clearly dealing with psychoses or defective mental states which are associated with narcolepsy without being pathologically related to it. Some other symptoms, however, appear to depend on hypnotic attacks. Putting on one side the sleep phenomena, true dreams, already referred

to as being possible in narcoleptic attacks, hallucinations have also been observed during the cataplectic attacks. Thus in Fisher's patient these were visual and the patient felt that they were real hallucinations; these phenomena were accompanied by the sensation of " things already seen " identical with what is observed in epileptic attacks and in lesions of the temporal lobe.

In Brook's patient the visual hallucinations had the peculiar characteristics of hallucinations; the patient, though he was vividly aware of them, realized clearly their unreality.

It is pointed out, however, that the appearance of these oneiric manifestations in cataplexy is remarkably rare. In the same way there is no mention of hallucinatory phenomena apart from the attacks. There exist cases with somnambulism and night terrors, but not references to typical oneiric phenomena.

Recently Levin has described a permanent psychological disturbance peculiar to narcoleptics, consisting of a difficulty in thinking, which the author, theoretically following the doctrine of Pavlov, attributes to the state of cortical inhibition. As a consequence of this disturbance, certain associative mechanisms and study in particular become extremely difficult. In one case seen by him it was the learning of a new language that became impossible; the act of learning each word demanded the establishment of a new conditioned reflex, which the repeated cortical inhibitions made difficult in the extreme. We have not been able to verify the symptom described by Levin in two cases in which we sought for it.

Also among the psychical alterations related to narcolepsy are certain paroxysmal disturbances of memory. In some cases what are in effect amnesic blanks are found following on the cataplectic attacks, sometimes of an anterograde nature.

Lastly, in very rare observations, there have been noted changes in disposition and character following on a long period of the illness. Thus, in the recent case of Pfeffer, after many years of narcolepsy a state of slowing down of activity and loss of initiative leading to complete invalidism was established.

From the résumé of the psychical symptomatology of narcolepsy, it is concluded that the picture, such as the one which we will describe later in our patient, of very intense " nightmares " completely independent of sleep, is a truly exceptional phenomenon.

The differential diagnosis of the two types of attacks characteristic of narcolepsy is worth mention, especially in regard to epilepsy.

Cataplexy is differentiated from hysterical attacks, without much difficulty, the latter being characterized as a rule by the variety and artificiality of the manifestations, by the concomitant symptoms, and by the patient's personality; from catalepsy, by the positions of sustained immobility, with or without disturbance of consciousness, with the appearance of sleepy and waxy flexibility, belonging generally to hysteria or to the picture of catatonia.

The differential diagnosis from familial periodic paralysis or myoplegia is also not difficult. The crises of the latter have a slowly progressive beginning and ending, a much longer duration, and are independent of emotional factors. Besides this the development of the illness, its familial nature and certain metabolic characteristics make the diagnosis easy. But it is difficult to distinguish from the attacks which Oppenheim calls " *lachschlag*," and which are actually called " geloplegia "; here, also, one is dealing with an abrupt loss of tone brought on by laughter, in typical cases almost identical with those of cataplexy. In the majority of cases they are actual observations of narcolepsy as the subsequent course of the disease shows, with the appearance of attacks of sleep. In some cases the geloplegia appeared to be merely a form of the aura of epilepsy. It is doubtful, therefore, whether geloplegia exists as a separate entity, the cases described probably belonging in reality to the cycle of narcolepsy with pure or transitory forms of cataplexy. The differentiation between narcolepsy and the prolonged states of sleep—" sleeps of Gowers "—is also generally not difficult. As a rule the patients are neurotics with schizophrenic psychoses or organic syndromes (encephalitis or tumours) which should not be confused with the characteristics of narcolepsy.

The most complex distinction is that which refers to epilepsy. As is known, there exist in this, as in narcolepsy, paroxysmal phenomena, with loss of consciousness, recurrent and transitory, and which in exceptional cases may be provoked by emotion (emotional epilepsy). Laughter may constitute the aura for the attacks,

and sleep may be intimately related with them, appearing as their equivalent or following them. If to these facts we add the existence of transitional cases in which epilepsy and narcolepsy coexist or alternate chronologically (Worster-Drought, Goldflam, Feré, Redlich, Wilson), the tendency of many authors, Wilson amongst them, to consider both phenomena as belonging to the same morbid process can be understood.

The Jacksonian conception, which Wilson has always defended, adapted itself perfectly to the existence of these two types of disturbance, which reveal the different degrees of functional release. However, clinically there exist very marked differences between epilepsy and narcolepsy.

In the first place, in epilepsy, the importance of hereditary-constitutional factors is decisive; increasingly so as a dominant influence in the etiology of essential epilepsy. In the narcolepsies, hereditary and constitutional factors do not appear to play an important part; a study made from the exceptional cases already referred to shows that the great majority of narcoleptics do not belong to the hereditary-biological cycle of epileptics.

In the second place, in epilepsy, the long continuance of the affection frequently leads to a state of permanent psychic alteration quite characteristic; the cases of narcolepsy in which a stable psychic defect becomes established are, as we have said, very exceptional (only two or three), different in every other respect, in all those cases, from the characteristic epileptic alteration.

In the third place it has not been possible to observe movements of a convulsive type in narcoleptics. The cases indicated refer to confusion with the reactionary movements already noted.

Disturbance of consciousness is characteristic of epilepsy; in narcolepsy there is either no loss of consciousness (cataplexy), or if there is it generally takes the form of sleep—a phenomenon which by itself can never be characteristic of epilepsy.

In narcolepsy a part of the phenomena is spontaneous, but another considerable part is provoked by emotional states. In epilepsy the provocation of phenomena by emotion is rare, and the sequence of emotion and attacks is not so immediate and typical as in narcolepsy. Certain epileptic attacks are preceded by laughter as an aura, but it is Wilson himself who rightly points out that the laughter in this case is different from the laughter that provokes cataplexy; while the latter constitutes a normal spontaneous phenomenon, the former is experienced by patients as a strange, automatic happening independent of their emotional state.

The electroencephalograms also distinguish the two types of phenomenon, showing the tracing of normal sleep in narcolepsy and the characteristic series of waves of high voltage, typical of epilepsy.

Lastly, pharmacological findings: inefficacy of the anti-epileptics in narcolepsy; inaction, or even, perhaps, aggravation of the symptoms of epilepsy, by the adrenalin-like psycho-stimulants. The logical conclusion appears, however, at the moment to be that of independence of the two morbid groups, epilepsies and narcolepsies; the existence of certain points of contact, and even of rare cases in which both conditions appear in the same patient, do not in any way invalidate this conclusion.

A few words on the symptomatic types of narcolepsy. We have already said that along with the essential forms of narcolepsy, there exist other cases in which the attacks are secondary to cerebral lesions, and we have even stressed that the latter present, clinically, certain atypical aspects.

The factors noted as causal of these secondary narcolepsies are very varied. Epidemic encephalitis deserves first place. Then come cerebral tumours, cranial injuries, disseminated sclerosis, polycythaemia, cerebral arteriosclerosis. The frequency of these symptomatic forms is markedly less than that of the idiopathic.

If, for example, we look for epidemic encephalitis in Neal's recent book, where 700 cases studied by the Matheson Commission are described, only two cases of narcolepsy secondary to this illness are described, so we may assume its great rarity.

The site of these lesions is always the same, whether it be the floor of the third ventricle, or more definitely, the infundibular region.

As to the forms we call essential, the name itself indicates the lack of known etiological factors.

Homologous heredity does not play an important part. Only in some cases

(Westphal, Ballet, Newmark, Rosenthal, etc.) has a tendency to sleep been noted in the patients' forbears. Psychopathic heredity (Lowenfeld, Curschmann and Prange) has also been observed by some authors. Excluding these rare and indefinite factors, we do not know anything as regards the etiology of the affection. Whether one is dealing with a constitutional state, or the consequences of a specific infection still unknown to us, is a question which our present data do not allow us to decide.

Any discussion as regards classification, therefore, has no place. At present we are obliged to maintain the distinction between the essential forms of narcolepsy and those which are symptomatic. Whether the former be called hypnolepsy, as Singer and Purves-Stewart would like, *Einschlafsucht* as Curschmann wishes, Gélineau's or Westphall-Géljneau's syndrome as Redlich wants, or simply narcolepsy, following the majority of authors, seems to us a matter of indifference.

The last designation, though not perhaps the most correct, is that which custom has familiarized and which we shall continue to use.

Clinical Notes.

Victor S. R—, aged 14, labourer. Native of Barrocas (Tôrres Novas), Portugal. Admitted on April 2, 1943.

The present illness began in the middle of August last year with a sudden attack of sleep, which lasted for one hour. Since then he has had attacks of sleep of variable duration—from half to one hour at first, and latterly for a little longer. He says he goes to sleep just as much when lying down, walking, or during his work. Several times when hoeing wheat he has gone to sleep standing up leaning on his hoe. On another occasion he walked for over a mile (1·5 km.) along a path leading by a river and intersected by gullies, sleeping all the time, only being woken up on arriving at his destination by the people who were waiting for him.

During the narcoleptic attacks he ceases to see and hear what is going on around him. He sleeps normally and frequently dreams. His dreams are varied and are not of any special interest. He always sleeps soundly at night, however much he may have slept in the daytime. He has never had insomnia.

At the same time as these attacks started, others of quite a different nature began to present themselves. The patient describes them as sudden attacks of loss of strength, which last for some minutes and cause him to fall to the ground when they become sufficiently intense. The patient himself points out that they are always brought on by laughter, and that no other emotional state is capable of provoking an attack. While it lasts he hears and feels but does not see, and once the attack has passed off he is able to repeat more or less correctly all that went on around him.

The patient knows the attack is coming on by feeling himself overcome by great weakness. Sometimes he hears a sibilant sound like the buzzing of a bee and sees a white spot dancing in front of his eyes.

The attacks of loss of tone are frequently followed by attacks of sleep.

Since the onset of the illness he has complained of frontal headaches, which are slight and of short duration. He never had any temperature or polyuria. He has frequent epistaxis.

Past history.—Measles at five years old. He did not have—or remember having—any other illness till April of last year, four months before the onset of the present symptoms. Then he was in bed with headaches and a temperature for three days. A week later he was perfectly well again. He returned to school, and two months later was able to do his examination for Grade 2.

Family history.—Father and mother healthy; has eleven brothers and sisters, the oldest 18 years, and the youngest six months; the patient is the third in order of age. All are healthy. He knows of no epilepsy in his near relations. A cousin of the patient became insane at the age of 20 and is at present in a mental hospital. Another distant cousin of the patient once suffered from nightmares, which were repeated on successive nights and afterwards passed off spontaneously without any recognizable cause.

Examination.—Physically is well developed—his apparent age agrees with his actual age. Bright, answers quickly and correctly to the questions put to him. Shows a certain amount of emotional instability with a tendency to laughter. Unstable facial expression. At times makes movements of a choreiform nature, with his arms and head.

Examination of organs and systems—normal.

Neurological examination—normal.

Mental examination (Terman's method): Passed all tests up to his age satisfactorily. Some less correct replies must be put down to his lack of education. Among these one can mention, for example, the test of definition of abstract concepts.

Analyses.

Blood count (19.v.43): R.B.C's., 3,840,000; haemoglobin, 68 per cent.; C.I., 0·89; W.B.C's.,

9,000; neutrophils, 65·5; eosinophils, 2·0; basophils, 0·0; lymphocytes, 28·5; monocytes, 4·0; slight anisocytosis.

Bleeding time 1 min. Coagulation time 5½ min.

C.S.F. (9/4): 1·2 cells per c.mm. Cytology: A few lymphocytes. Albumin: 0·25 gm. per cent. Pandy: Negative. Glucose: 0·68 gm. per cent. Normomastic curve normal.

W.R.: Negative (blood and C.S.F.).

Basal metabolism: — 9·2 per cent.

Fasting blood sugar (8/4): 0·93 gm. per cent.

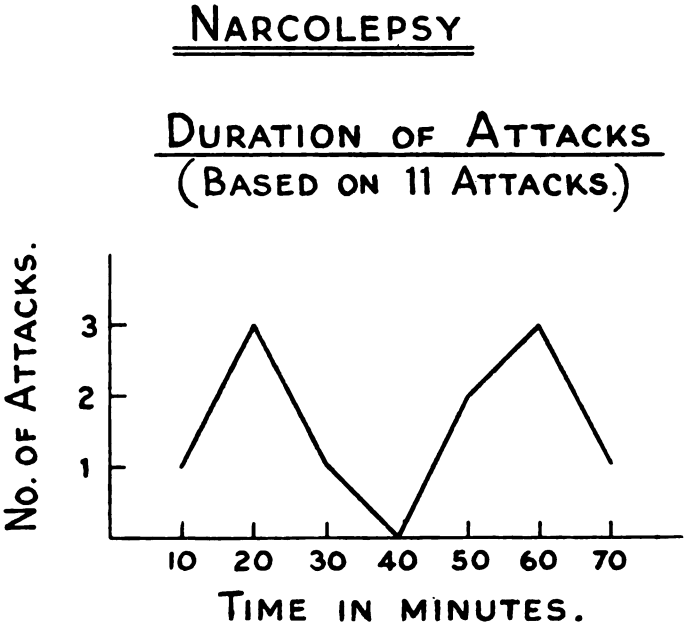
Examination of urine: Normal.

Examination of gastric juice: Normal.

We were able to verify the two types of attacks described. Their symptomatology will be described in detail later. Meanwhile a new phenomenon arose. At the beginning of May the patient presented himself with fever, caused by an acute infection, which lasted about a week, during which time the temperature sometimes reached 102·2°. The exact nature of the disease was not clear, the blood picture was normal and X-ray of the chest negative. We believe it was influenza. It was after this infectious state that the patient began to show oneiric manifestations. He appeared one morning saying that a ghost had come in the night and held him by his arms. Since that time the vision has appeared every night, taking one of three forms: a cat, a figure of a woman, and a rat. The hallucinatory phenomena are not limited to vision, there being an auditory component as well. These will be described in a special paragraph later, as also the narcoleptic and cataplectic attacks.

Narcoleptic attacks.—These attacks come without any apparent provocation. They have, according to the patient, an aura of ill-humour—he feels the onset of great boredom, something which he cannot easily explain, but which seems to be a depressive modification of the emotional state. Then, little by little he falls asleep. Sometimes at the beginning his attempts to resist the onset of sleep are obvious; he opens his eyes with difficulty, but he insists on opening them, yawns and tries to remain standing, but his resistance gradually gets less and finally he falls asleep. At other times, perhaps more often, the beginning of the narcoleptic sleep occurs suddenly.

The sleep during the attacks does not differ from normal sleep—respiratory rhythm, hypotonus of the soft palate as shown by snoring, the attitude in bed and distribution of tone are quite identical. The cardiac rhythm behaves in the same way. Just as in normal sleep, that of the narcoleptic attacks is liable to be broken by any violent stimulation, especially acoustic stimuli. The somnolent patient is able to reply to what we ask him, afterwards falling back into sleep. The waking up does not differ from that from normal sleep. The length of the attacks is very variable, lasting from a few minutes to an hour or more. Their frequency is very great. From admission the patient had some six to ten attacks daily, more severe in the afternoon than in the morning. Their average duration is expressed in the graph given below.



Cataplectic attacks.—These attacks are always conditioned by laughter. When the patient laughs sufficiently the face begins to be flushed, and then abrupt movements can be observed which at times have a choreic form and affect the head and upper extremities. The head slowly hangs down, to be afterwards raised by one of the abrupt movements referred to. The closing of the eyelids is accompanied by brisk blepharospasm. In the upper limbs the jerky movements begin at the base. Sometimes they accompany the rhythm of the laughter, at others they are independent of it. This first phase is followed by a progressive loss of tone: The head falls and the arms hang down, the body doubles up and finally falls to the ground. The average length of these attacks is 30 seconds.

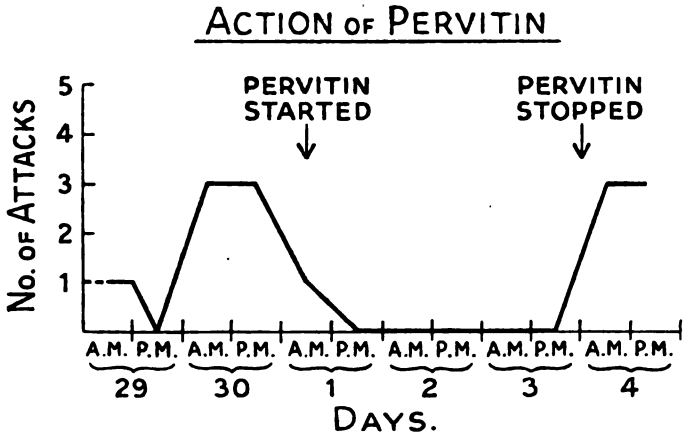
The complete loss of tone is followed after some seconds by various attempts at raising himself up; he lifts his head, tries to raise his arms and straighten his back. These reactionary movements are still abrupt and imperfectly co-ordinated. When the crisis is over the patient generally resumes his occupation; sometimes, however, the cataplectic attack is followed by prolonged sleep. During the attack the tendon reflexes remain normal, but we were able, on two occasions, to obtain extensor plantar responses.

When in cataplexy the patient does not reply to questions, but his consciousness seems to remain clear; once the crisis is over he is able to refer to everything which took place during it, and to reply to the questions which were put to him then. The loss of tone is not equal in the flexors and extensors. It is much greater in the latter: the head falls forwards, the body doubles up and the patient, as he falls, is in a position of flexion, unrolling when he reaches the ground. The movements which the patient makes, as much at the beginning of the attack as after the fall, give the impression of voluntary reaction to the loss of tone—attempts on his part to overcome the progressive paralysis. Not every attack gives the whole picture just described; some of them are limited to mere flexion of the head and trunk, with the arms hanging down and interrupted by reactionary movements antagonistic to the loss of tone. Even in these crises the redness of the patient is apparent, only disappearing at the end of the attack when its place is taken by pallor. The severity of the attacks seems to be proportional to the intensity of the laughter, and thus a frustrated attack can be turned into a complete one by tickling the patient. During the crisis, if it be mild, the patient automatically seeks a place where he can sit or lie down, doing the same thing when the attack passes if he has fallen on the ground. Immediately following this he is able to reply and converse.

Oneiric manifestations.—As has been said already, the patient complained of visions which he had had during the night and which distressed him greatly. He as frequently sees the head of a cat or rat as the figure of a woman with a kerchief on her head. These apparitions alternate, one appearing each night. Each of them comes up to the patient's bed, rarely remaining at the door of the ward. When it is the cat or the rat (the former is the most common of all) he sees them coming, jumping towards his bed. Then he hears a sound different from that usually made by these animals, a sound which he compares to that produced by goats' feet. The acoustic factor of his oneiric manifestations is not limited to this sound, however; he hears, as it were, a grunting, which he supposes is produced by the animal he sees. It even happens that the patient himself will make the sound; when he thinks that the rat is near the bed or underneath the bed-clothes, he strikes the bed with his hand and immediately hears the sound as if there were a cat or a rat there which had been frightened.

The intensity and the reality of the visual hallucinations is considerable; he sees the figures distinctly, fixes them in space, and their appearance covers up the outline of everything behind them. The details of sensory content of these visions is referred to, such as the colour of the cat's eyes and the hairs on the rat's snout, which shows how vividly the figures appear.

The oneiric phenomena are recorded perfectly by the patient; he gives a spontaneous and



detailed account of them, appearing every morning to complain of his visions of the previous night.

When the oneiric phenomena occur the patient generally has a considerable reaction of terror. He calls the night nurse, points to the place where he sees the vision, confesses his fear and begins to cry. By day, when he recounts his previous visions, he reveals a curious attitude of fear, and at the same time, of hostility towards our incredulity.

While these psycho-sensory phenomena have been experienced there has been a definite modification in the psychism of the patient. Before, he was submissive, most polite, habitually cheerful, listening respectfully to all that was said to him. Now he is difficult, showing a definite hostility to the staff and even to the doctors, replying impolitely at times. He often wants to take his own discharge, in a threatening way, saying that if it is not granted he will commit suicide. A definite change in his nature has been noticed: frequent "dysthymias" may be seen, sometimes irritation, and at others, weeping. He is suspicious, has doubts about the injections he is receiving, and looks on the other patients and even on us with suspicion.

The therapeutic action of a benzedrine substitute was tried on the patient—the hydrochloride of 1-phenyl-2-methylamino-propane, commercially known as pervitin. It shows its effect, as American authors affirm, efficiently and with safety. Its administration in doses of 6 to 9 mgm. daily, rapidly and almost completely checks the attacks. The second graph reveals its efficacy.

Our observations suggest several questions relating to the pathogenesis of narcolepsy. The whole discussion appears to us to revolve around the question of the identity of narcoleptic sleep and physiological sleep. Contrary to the opinion of Notkin and Jelliffe, who say that such a discussion is useless, owing to the frequency with which states of disturbed consciousness or coma in organic conditions are called sleep, we think that this discussion is essential for the pathology of the morbid state with which we are dealing.

Analysis of narcoleptic crises shows, as we saw, as much in the history of our case as in the considerations which preceded it, that the relation between narcoleptic sleep and physiological sleep can be affirmed with some certainty. An important part of the attacks which characterize narcolepsy consists of simple attacks of sleep; the conscious state, the loss of normal attitude, the lessening of muscular tone, the vegetative phenomena of vagal hypertonus, are identical with those which are found in physiological sleep. The possibility, which almost always exists, of waking the patients is another characteristic which relates narcoleptic to normal sleep, and separates it from states of coma.

The electro-encephalograms and pharmacological proofs finally complete this approximation.

If we accept the identity of narcoleptic sleep with the physiological phenomenon of sleep, we then have to seek what the disturbance of the hypnic mechanism consists in which constitutes narcolepsy.

We distinguish between two types of disturbance. In the first place there exists a disturbance in the rhythm of sleep; in the second, an alteration of the synergism of the phenomena which normally constitute sleep. The appearance of spontaneous or provoked attacks of sleep during the day constitute an alteration of the nocturnal rhythm of physiological sleep of man. We see no reason, contrary to what Murphy has recently written, to admit that we are dealing with a polyphasic rhythm of sleep, phylogenetically and ontogenetically early, as occurs in children and lower animals, as distinct from the monophasic rhythm of adult man. In our opinion there is no change of rhythm, since nocturnal sleep exists in narcoleptics as a general rule. What there is is an abnormal facility of the mechanisms producing sleep, a phenomenon which we consider as similar to that of a lowered threshold of stimulation.

There exists further, in narcolepsy, a second type of disturbance of the hypnic mechanism, just as important as the first. We refer to the phenomena of dissociation of the elements which constitute sleep. Earlier in this article, when dealing with the relationship between narcoleptic and cataplectic attacks we had occasion to allude to this dissociation. We consider the phenomenon of sleep as constituted by four varieties of manifestation, two of a negative nature, the dulling of consciousness and the disappearance of the erect position and of tone; and two of a positive nature, the hypertonus of the parasympathetic vegetative nervous system and the release of dreams. These four varieties of manifestation occur simultaneously in normal sleep.

Now the analysis of the clinical picture of narcolepsy shows precisely that in the greater number of paroxysms of the affection symptoms are present which

express the dissociation of the elements referred to, and that some of the types of paroxysm mentioned are exclusively made up of the isolated appearance of one of the elements normally blended in sleep. From this point of view our present case is extremely instructive. Simple attacks of sleep occur with normal falling asleep and waking; attacks of sleep in which on waking the persistence of loss of tone shows a dissociation between the course of this and that of the interruption of consciousness; crises of pure cataplexy with complete conservation of lucidity; and finally attacks of oneiric manifestations with very intense hallucinatory phenomena, independent, in their turn also, of the remaining phenomena referred to.

Between the dreams which occur in normal sleep, the so-called hypnagogic hallucinations, the pure oneiric phenomena of our patient, and even perhaps the "hallucinosis" described by Lhermitte in lesions of the tegmentum, all degrees of transition exist, constituting perhaps different forms of activity of the same functional mechanism.

The analysis of the attacks of the case referred to entirely justifies the affirmation we made, that they constitute the expression of the isolated and pathological appearance of one of the elements which constitute physiological sleep.

According to our conception, therefore, the physiopathology of narcolepsy can be summarized as a quantitative and qualitative disturbance of the mechanism of sleep.

This is tantamount to saying that the pathogenesis of narcolepsy enters into the problem of physiological sleep. The uncertainties existing even to-day as regards the mechanism of the latter are well-known problems which have their expression in a great number of theories, propounded one after another. If the cases of symptomatic narcolepsy, as those of prolonged sleep, due to inflammatory lesions or tumours of the meso-diencephalic region are in favour of the existence of a centre of wakefulness situated in the posterior part of the floor of the third ventricle, it is not less certain that the existence of the centre does not suffice, by itself, to explain either the mechanism of sleep or the pathogenesis of narcolepsy.

In sleep there exist functional phenomena of a different order and of physiological action apparently opposite, some negative, inhibitory, others positive, of release action, presupposing functions situated at different levels. Narcolepsy would then be the expression of a hyperexcitability and dissociation of these complex functional mechanisms.

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SHOCK-THERAPY IN PSYCHOSES: A POSSIBLE RATIONAL BASIS AND ITS CLINICAL APPLICATIONS, BASED ON THREE YEARS' EXPERIENCE OF ITS USE IN MILITARY PSYCHIATRY.

By G. Taylbur Stockings, M.B., D.P.M., Captain R.A.M.C.

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In spite of the voluminous literature on the shock-therapies which has appeared in recent years, there is as yet little unanimity of opinion among psychiatrists as to the value of the anoxic and hypoglycaemic shock-therapies, and their indications, possible scope and limitations in the treatment of psychoses. Most potent in perpetuating this unsatisfactory state of affairs have been the too-rigid reliance on masses of statistics in evaluating results of treatment, the oft-repeated statement that the therapy is purely empirical, and last, but not least, the unfortunate publicity which it received at its inception, the result being that lately there has been a tendency to discredit the therapy, and a growing scepticism as to its efficacy.

The purpose of this article is to present evidence for a rational basis of the treatment, following intensive experience since its inception in this country, including three years of its practical application in military psychiatry.

The Case-Material.

The case-material seen in military hospitals is especially suitable for study for the following reasons:

(1) It consists almost entirely of young and physically healthy patients of the age-group 18–35 years.

(2) The cases are nearly all of recent and acute onset.

(3) They are almost all cases of the psychotic types found in civilian practice—for in my experience there is no special type of "war psychosis."

(4) The prognosis untreated is the same as for civilian cases.

By far the commonest cases encountered are the schizophrenic—all types—and the mixed schizoid-depressive; the classical manic-depressive and chronic types of delusional psychosis are comparatively uncommon.

The principal difference between military and civil psychiatric practice is, in the former, the comparatively large percentage of patients brought for treatment in the very early stages of their disease. In civil life it is surprising how long manifest psychotic symptoms can exist before the patient is brought for treatment, whereas under military conditions any slight conduct abnormality or deterioration of efficiency is quickly detected in the unit, so that patients are referred to the psychiatrist long before they reach the chronic stage; the importance of this will be stressed later.

Rationale of the Treatment.

I consider the conditions commonly described as schizophrenia, affective, delusional and confusional psychoses to be all manifestations of a single organic cerebral disorder, consisting of a profound derangement of the oxygen-glucose metabolism of the brain-cells, which affects principally the centres concerned with the higher thought-processes, affective and intellectual functions. This condition, at first reversible, may, if long-continued, lead to permanent cerebral damage.

Clinically two main types can be distinguished—those which respond to convulsive (anoxic) shock, and those which respond to insulin (hypoglycaemic) therapy.

For these two groups I suggest the terms "dysoxic," or oxygen-disordered,

and " dysglycolytic," or glucose-disordered respectively ; i.e. in the first group the fault is primarily in the oxygen, in the second in the glucose, metabolism.

In the first group are found conditions characterized by depression of mood, apathy, retardation, persecutory delusional states with a setting of depression, anxiety, and strongly appropriate affective reaction. This would include the classical depressives, acute hallucinatory-paranoid states, and mixed depressive and schizoid-depressive types ; also some types of alcoholic psychoses.

The second group comprises cases showing elation and motor hyperactivity, excited and catatonic states, and cases with bizarre delusions and hallucinations, and the type with thought-disorder and emotional incongruity characteristically found with the hebephrenic form of schizophrenia. Mania, simple and hebephrenic schizophrenia and the delusional psychoses are typical examples. This group are almost all resistant to anoxic shock therapy, but respond favourably to insulin.

Although we have no direct method of confirming this hypothesis by direct observation of the metabolism of human brain-cells *in vivo*, the clinical and experimental evidence in its favour is impressive, and may be briefly summarized as follows :

(1) In acute psychotics, the clinical signs are those of an acute cerebral intoxication—especially the concomitant physical signs (cutaneous anaesthesia and hyperaesthesia, etc.).

(2) These disorders are favourably affected by anoxic and hypoglycaemic therapy, which directly influence the oxygen-glucose metabolism of the brain ; they are resistant to ordinary methods of psychotherapy.

(3) In the normal individual, experimental psychoses almost identical in form with these conditions can be induced by administration of certain drugs, e.g. mescaline ; these agents have been found to produce their effects by a direct action on the cerebral glucose-oxygen metabolism.

(4) Psychotic symptoms are found in conditions of interference with the normal oxygen-supply of the brain. Examples are lowered oxygen-tension in mountain-sickness and aviation-conditions, chronic respiratory obstruction in nasal disease, overbreathing and inhalation of certain gases (nitrous oxide and carbon monoxide).

(5) The beneficial effects observed in certain psychoses following the inhalation of CO_2-rich mixtures, when the action is again due to a temporary interference with the oxidative processes of the cerebral cells.

(6) In chronic psychotics, permanent and incurable residues are found, e.g. fixed delusions, apathy, and persistent hallucinations ; these can be explained by the presence of a permanent and irreversible physical change in the higher cerebral neurones and association-tracts. The presence of such changes in the brains of chronic schizophrenics has been demonstrated by the researches of Mott and other workers.

(7) Normal cerebral function is dependent almost exclusively on the use of oxygen and glucose.

Scheme of Treatment.

The scheme of treatment employed, bearing in mind these facts, will now be briefly described. First, I must emphasize that the two essentials for success are early diagnosis and prompt and vigorous treatment. It is, of course, useless to expect that, once the disease is established, damaged synapses and neurones can be replaced by means of any form of pharmacotherapy, however devotedly and assiduously applied. My experience leads me to believe that, in the acute hebephrenic types at any rate, the damage is done within the first few weeks, or even days, of the disorder ; and, further, that that damage is directly due to the dysglycolytic process and not, as has been recently suggested, to the over-enthusiastic use of pharmacotherapy.

The procedure which I employ for acute cases is as follows : Immediately the diagnosis of an acute psychosis of malignant (i.e. schizophrenic) type is made, anoxic shock-therapy by means of either the electrical or cardiazol method is started at once. My technique differs in no way from that usually employed, except in the frequency of application. For the first five applications shock is administered once daily ; experience has shown that it is useless to expect any response from shock-therapy on alternate days or less frequently. This may

sound drastic, but provided the patient is in good general health and co-existing physical disease is absent, there is no contra-indication. If the case is one of the dysoxic type, the patient will respond rapidly after four to five applications; as soon as a response is evident, the treatment is changed to a regime of shock on alternate days, or thrice weekly, until a complete abolition of symptoms has been obtained. The average total number of shocks required to obtain this result has been found to be nine to ten, after which the treatment is discontinued.

If, however, the case shows no signs of improvement after four to five shocks, or relapses or fails to make further improvement after the full course of ten, then it is considered to be of the dysglycolytic, and therefore more malignant type. Shock-therapy is then discontinued, and insulin commenced forthwith. The technique employed for this is in no respects different from that usually described.

In my opinion anoxic and hypoglycaemic therapies act very quickly, if they are going to produce a favourable response at all. The possible causes of failure to produce a response will be briefly indicated later.

The advantages of this intensive therapy are the rapid suppression of such symptoms as restlessness, refusal of food, and suicidal and destructive tendencies and the need for frequent sedation, with their consequent nursing difficulties. The patient shows rapid physical improvement and becomes more accessible to psychotherapy. The principal result aimed at is, of course, the arrest of the disease-process before incurable cerebral damage is produced.

In acute depressives the procedure followed is the same as for the acute dysoxic type; usually a remission is obtained after four to five shocks. If the case fails to show any improvement after this number of applications, then the case is one of acute hysterical or anxiety-reaction, and not a true psychotic depression; these cases are very common in military practice, and I have found the response to anoxic shock to be the most reliable diagnostic test.

For the milder psychotic cases anoxic shock is administered two to three times weekly, instead of once daily; if no improvement is noted after ten shocks it is discontinued and insulin therapy is commenced in the usual way.

Results of Treatment.

In military psychiatric practice it has been found that in all types of cases treated by these methods, a complete remission may be expected in approximately 70 per cent., definite improvement in 15 per cent., and failure in 15 per cent. The last two groups consist mainly of the more chronic cases.

My experience of the relative values of the two forms of therapy is in complete accordance with that of other workers, viz. that anoxic shock is the treatment of choice for depressives, but is relatively ineffective for the hebephrenic form of schizophrenia and the delusional (paraphrenic) psychoses. I have found that hebephrenics and paraphrenics are either completely resistant to anoxic shock, or make a dramatic remission after a few shocks, to be followed only by a complete relapse on discontinuing the treatment. If treated in the early stages of the disease with insulin, however, they stand a good chance of making a complete and lasting remission, and there is no justification for the pessimistic view commonly held with regard to these cases. The poor results obtained in civil practice with these cases can be explained by the fact that, as these conditions are almost always of insidious onset, the vast majority are already in the chronic stage when brought for treatment. The simple form of schizophrenia with purely negative features has been found to be the type with the worst prognosis. Insulin-therapy is always ineffective, and, although they often make a dramatic temporary improvement with anoxic shock, they invariably relapse and deteriorate on discontinuing treatment. These cases are probably from the beginning examples of a purely degenerative form of brain disease, and should be considered as in a class by themselves.

Alcoholic psychoses of the hallucinatory-paranoid type without evidence of dementia have been found to respond excellently to anoxic shock.

In cases treated with insulin the average number of comas found to be effective in producing a lasting remission has been found to be 20 to 40. In all cases which are going to respond, signs of improvement become evident after the first half-dozen or so injections, and long before the coma-dose is reached.

With regard to the simultaneous use of insulin and anoxic shock in combination, I have found resort to this to be very rarely necessary.

Failure of Treatment.

Failure to obtain a satisfactory response may be due to the following causes:

(1) A case admitted with florid symptoms, which responds well at first, but shows persistent residual signs is almost always a case of long duration, the florid symptoms present on admission being merely an acute exacerbation.

(2) Failure to institute insulin treatment sufficiently early in the course of the disease.

(3) Insulin-resistance in dysglycolytic cases; failure to produce coma with a dosage of 150 units or over is invariably a bad prognostic sign.

(4) Forced abandonment of treatment on account of intercurrent physical disease.

With regard to the failures, I have found only one type of case which may be definitely made worse as the result of treatment, namely, chronic quiescent schizophrenics, who have only mild residue and have made a partial social adaptation. In these, shock-therapy may actually precipitate an exacerbation in the form of an acute hallucinatory-confusional episode. In consequence I consider the treatment to be definitely contraindicated in these cases. The explanation of this phenomenon is obscure.

Complications.

The incidence of major complications has been extremely small. In a series of nearly 300 cases treated with anoxic shock (cardiazol, triazol and electrical) I have encountered only two fractures—one vertebral and one scapular—and one simple dislocation of the shoulder-joint, none of which were followed by serious sequelae.

I have had one case of acute cardiovascular syncope; this occurred in an apparently healthy schizophrenic following a repeat dose of electro-convulsive therapy. The patient exhibited complete cessation of the heart and respiration with asphyxia pallida; vigorous artificial respiration and intravenous coramine were immediately effective, and no serious after-effects were observed. This very alarming complication was apparently due to idiosyncrasy on the part of the patient.

Of minor complications may be mentioned headache, muscular pains, painful spine without radiological evidence of fracture, dislocation of the jaw, and left-sided cardiac pain localized to the apex-beat. These have nuisance-value only, and require symptomatic treatment.

No major complications have been encountered in insulin-therapy. Minor complications have included delayed after-shock, transient mental confusion lasting 12 to 24 hours following recovery from coma, delayed recoveries from coma, and metabolic reactions consisting of pyrexia, profuse sweating, rigor and malaise. The method of dealing with these has been that laid down in standard works on the subject.

Contraindications.

These have been the same as those laid down in standard works on the subject.

Summary.

(1) The results of three years' experience of shock-therapy in military psychotic casualties are presented and discussed.

(2) Clinical and experimental evidence is presented for an organic basis of the conditions described, and a probable pathology is suggested.

(3) A rational basis for the anoxic shock and insulin therapies is suggested.

(4) The importance of early diagnosis and treatment is emphasized.

(5) The value of hypoglycaemic shock-therapy and the comparative ineffectiveness of anoxic shock in hebephrenia are confirmed.

(6) The high degree of safety of these therapies is confirmed.

My acknowledgments are due to Lieut.-Col. R. W. Armstrong, R.A.M.C., for kindly providing the facilities for carrying out the treatment, and for permission to use the case-material described in the compilation of this article.

SOME PROBLEMS ARISING FROM A STUDY OF MENTAL PATIENTS OVER THE AGE OF SIXTY YEARS.

By Felix Post, M.B., D.P.M.,

Assistant Physician to Jordanburn Nerve Hospital, Edinburgh.

Statistical Survey.

It is generally known that in recent years there has been a considerable increase of the elderly population. In addition, we assume that unless the birth-rate rises again, an increasing proportion of the population will be found in the involutional and senile periods of life. This development has already begun; whereas in 1901 7·6 per cent. of the population of Scotland were over 60 years of age, the percentage in 1941 has been estimated at 13·0. Men are less long lived than women, the figures being 6·6 and 8·6 in 1901, and 12·1 and 13·8 in 1941.

The rise of the population over 60 in absolute figures, as well as relative to the total population, has been reflected in the age distribution of admissions to the Royal Edinburgh Hospital for Mental and Nervous Disorders (Table I and Graph 1). An analysis of the admission figures from 1903 to 1942 has been undertaken, and whereas at the beginning of the century round about 15 per cent. of admissions were over 60 years old, during the years preceding the present war this figure had risen to about 27 per cent., i.e. whereas in 1900 roughly every seventh patient admitted to the hospital was over 60 years old, by 1938 every fourth patient was above that age.

American figures show a similar trend. At the State Hospital for Mental Diseases, Howard, R.I., in 1939–40 about 25 per cent. of new admissions were in the senile group (Wadsworth, Quesnel *et al.*, 1943), and whereas in 1829–32 only 4·5 per cent. of admissions to the Pennsylvania Hospital were over 60 years old, that figure had risen to 14·5 per cent. in the years 1929–32 (Palmer, Braceland and Hastings, 1943).

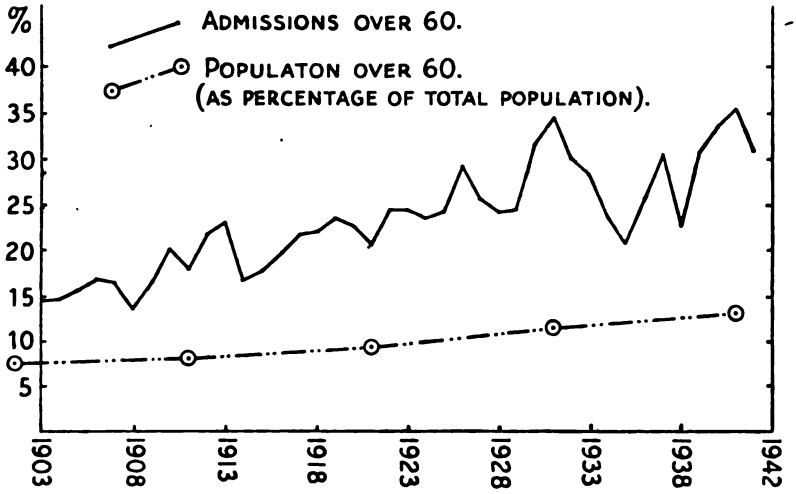
As regards sex distribution, the number of female admissions over 60 to the Royal Edinburgh Hospital was greater than that of male admissions for every year excepting six occasions. On the other hand, the percentage admission-rate over 60 showed no striking or consistent differences between males and females, and there was thus no evidence that mental illness as a whole tends to occur more often over the age of 60 in males than in females (Table I, Graph 2).

While the first World War did not produce any increase in the proportion of senile admissions, the rise of admissions over 60 in the present war has been striking —from 25·1 per cent. in the years 1935–8 to 32·6 per cent. in 1939–42 (Table II, Graph 3).

Graph 4 shows the trend of admissions over the age of 60 expressed as percentages of the total admission figures for 5-year periods since 1904. There has thus been a steady rise of admissions in this age-group, with the exception of the period 1933–38. This trend has been compared with the rising percentage of people over 60 in Scotland, and it can be seen that on the whole there is a tendency of the two curves to diverge. In other words, the admissions of patients over 60 to hospital have increased at a higher rate than would have been expected from the increasing proportion of people over 60 in the general population. However, admission-rates to a mental hospital are not necessarily parallel to the incidence of mental disease in the same district, and comparing figures for one hospital with population statistics of the whole country should not lead one to more than tentative conclusions.

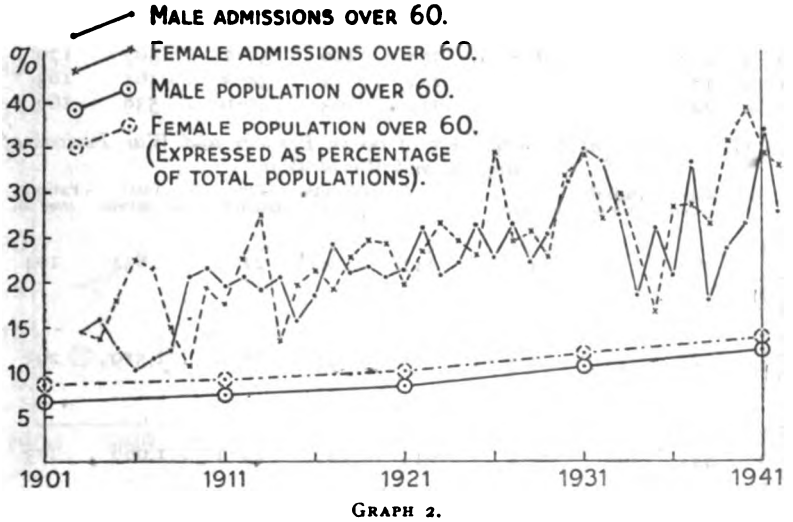
I am indebted for these figures to the Registrar-General for Scotland.

ADMISSIONS TO ROYAL EDINBURGH HOSPITAL OF PATIENTS OVER 60 YEARS OF AGE 1903-42
(EXPRESSED AS PERCENTAGE OF TOTAL ADMISSIONS)



GRAPH 1.

MALE AND FEMALE ADMISSIONS OVER 60 YEARS OF AGE 1903-42
(EXPRESSED AS PERCENTAGE OF TOTAL MALE AND FEMALE ADMISSIONS)



GRAPH 2.

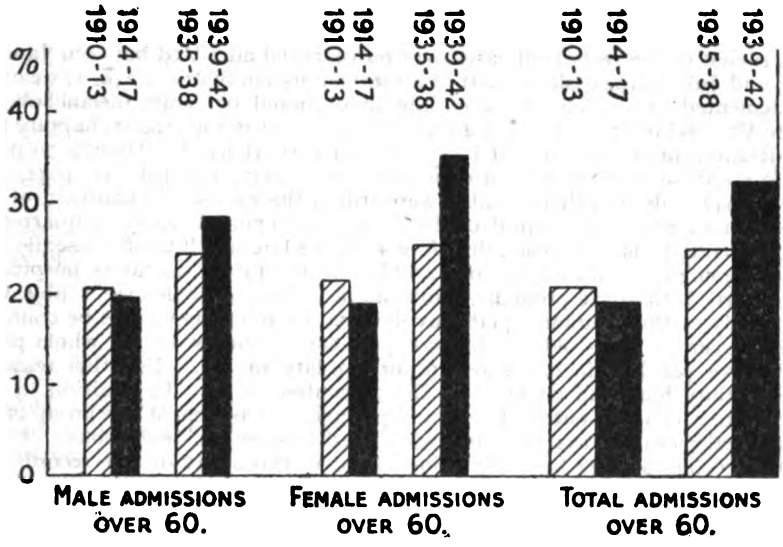
TABLE I.—*Admissions to the Royal Edinburgh Hospital for Mental and Nervous Disorders, 1903–42.*

	Male admissions.	Patients over 60.	Percentage.	Female admissions.	Patients over 60.	Percentage.	Total admissions.	Patients over 60.	Percentage.
1903	196	28	14·3	215	31	14·4	411	59	14·4
1904	195	31	15·9	262	36	13·7	457	67	14·7
1905	200	25	12·5	228	41	17·9	428	66	15·4
1906	169	17	10·1	216	48	22·2	385	65	16·9
1907	154	18	11·7	163	35	21·5	317	53	16·7
1908	106	13	12·3	133	20	15·0	239	33	13·8
1909	97	22	20·6	112	12	10·7	209	34	16·3
1910	79	17	21·5	116	22	19·1	195	39	20·0
1911	76	15	19·7	103	17	16·5	179	32	17·9
1912	107	22	20·6	115	26	22·6	222	48	21·6
1913	125	24	19·2	113	31	27·4	238	55	23·1
1914	112	23	20·5	128	17	13·3	240	40	16·7
1915	228	36	15·8	234	46	19·7	462	82	17·7
1916	230	43	18·7	194	41	21·1	424	84	19·8
1917	186	45	24·2	207	40	19·3	393	85	21·6
1918	218	46	21·1	242	55	22·7	460	101	22·0
1919	221	48	21·7	250	62	24·8	471	110	23·4
1920	232	48	20·7	291	70	24·1	523	118	22·6
1921	243	52	21·4	263	52	19·8	506	104	20·6
1922	239	62	26·0	267	62	23·2	506	124	24·5
1923	77	16	20·8	133	35	26·3	210	51	24·3
1924	86	19	22·1	126	31	24·6	212	50	23·6
1925	94	25	26·6	113	26	23·0	207	51	24·2
1926	110	25	22·7	139	48	34·5	249	73	29·3
1927	109	29	26·6	130	32	24·6	239	61	25·5
1928	99	22	22·2	113	29	25·7	212	51	24·1
1929	106	27	25·5	87	20	22·9	193	47	24·4
1930	96	30	31·2	97	31	31·9	193	61	31·6
1931	106	37	34·9	117	40	34·1	223	77	34·5
1932	89	30	33·7	111	30	27·0	200	60	30·0
1933	102	28	27·5	111	33	29·7	213	61	28·6
1934	87	16	18·4	124	33	26·6	211	49	23·4
1935	91	24	26·4	126	21	16·6	217	45	20·7
1936	96	20	20·8	175	49	28·0	271	69	25·5
1937	117	39	33·3	177	51	28·8	294	90	30·6
1938	139	25	18·0	167	44	26·3	306	69	22·5
1939	176	42	23·9	229	82	35·8	405	124	30·6
1940	229	61	26·6	278	109	39·2	507	170	33·6
1941	187	69	36·9	274	94	34·3	461	163	35·4
1942	226	63	27·9	312	103	33·0	538	166	30·9

TABLE II.—*Admissions Over the Age of 60 in Pre-war and War Periods of First and Second World War.*

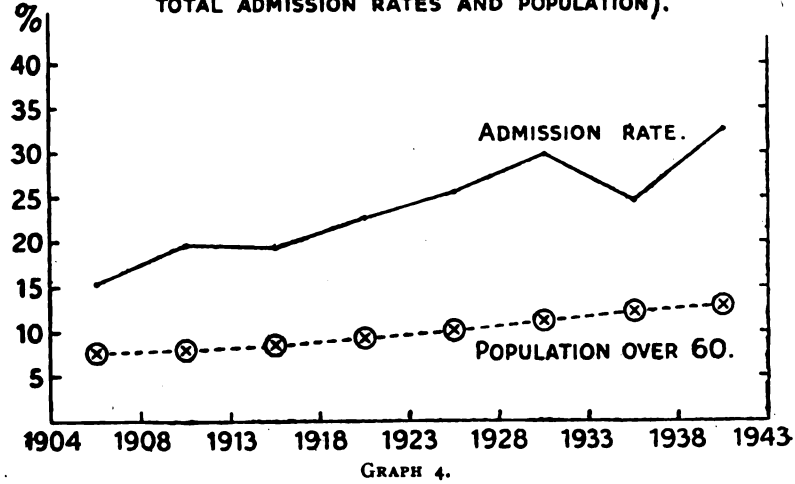
	Male admissions.	Patients over 60.	Percentage.	Female admissions.	Patients over 60.	Percentage.	Total admissions.	Patients over 60.	Percentage.
1910–1913	387	78	20·7	447	96	21·4	834	174	20·9
1914–1917	756	147	19·5	763	144	18·9	1,519	291	19·2
1935–1938	443	108	24·4	645	165	25·3	1,088	273	25·1
1939–1942	818	235	28·7	1,093	388	35·5	1,911	623	32·6

ADMISSIONS OVER THE AGE OF 60 IN PRE-WAR AND WAR PERIODS OF FIRST AND SECOND WORLD WARS. (EXPRESSED AS PERCENTAGES OF TOTAL ADMISSIONS)



GRAPH 3.

COMPARISON OF ADMISSION RATES OVER 60 WITH POPULATION OVER 60. (EXPRESSED AS PERCENTAGE OF TOTAL ADMISSION RATES AND POPULATION).



GRAPH 4.

Diagnostic Grouping of Cases.

The situation as regards patients over 60 years old has been more closely examined in the wards of the private unit of the Royal Edinburgh Hospital. Here, in Craig House, on July 1, 1943, out of a total of 280 beds, 118 were occupied by patients over 60 years of age, 84 females and 34 males. (For duration of residence see Table III.) Of the 118 cases, 51 were schizophrenics and 20 were manic-depressive psychotics; 25 cases were involutional or senile melancholics, and 22 were cases with dementia, i.e. presenile, senile and arteriosclerotic psychotics (Table IV).

A review of the records of cases over 60 years old admitted between January 1, 1937, and July 1, 1943, shows that of a total admission figure of 240, 125 came into the demented group and 58 were late involutional or senile melancholic cases (Table V). While the demented group of senile cases is the largest, happily for the bed situation in the hospital, it is also the most short lived. Though 79 patients of this group were admitted between January 1, 1937, and July 31, 1941, yet by July 1, 1943, only 9 of their number were still in the wards. In contrast, of the 41 involutional melancholics admitted during the same period, 10, i.e. a quarter, were still occupying beds. It looks, therefore, as if the late involutional or senile melancholic is going to be a more serious problem in the future, as far as hospital beds are concerned, than the presenile, senile and arteriosclerotic dement (Table VI).

A study of the problem of late involutional melancholia cannot be confined to patients over 60 years old; it has complex connections with the whole problem of affective psychiatric conditions occurring late in life. For this reason the present study has been confined to the demented group. In addition, it is not intended to review the entire clinical and pathological aspects of this group of cases. The clinical pictures have been fully described in standard text-books.

Only certain aspects have been singled out in this study of case-records of 111 cases admitted to Craig House since 1937, and these include 37 patients personally attended during part or the whole of their stay in hospital. From a diagnostic point of view, 54 cases fall into the senile and 44 into the cerebral-arteriosclerotic group; 6 cases were regarded as suffering from a presenile dementia of the Alzheimer-Pick type, and 7 cases, all of whom only survived for a few days in hospital, have been placed under the heading of terminal confusional psychosis, as there was not sufficient evidence for further classification (Table VII).

Admission of Senile Patients to the Mental Hospital and Prognosis.

The admission of senile patients to a mental hospital is apt to be regarded with misgiving by their friends and relatives, and it is therefore important to examine the reasons for which such admissions became necessary in our series of cases. What, in fact, were the symptoms and disorders of behaviour which finally made it clear that the patients could no longer be looked after outside the mental hospital?

By far the largest proportion of patients had become intractable through what may briefly be called a confusional syndrome; they had become noisy and very restless, getting in and out of bed, often destructive, and in the majority of cases were suffering from visual, and a little less often, auditory hallucinations. In a few instances there was actual aggressiveness and violence. Aimless wandering, without other behaviour disorder, was responsible for admission in a small group of cases, and similar small numbers had become too difficult to look after because they suffered from paranoid delusions or suicidal tendencies. Another larger group of patients had become so degraded in their habits that they were no longer supportable at home or under general hospital conditions. Here, and in a small group of patients who had no friends, social reasons for admission were prominent. In a series of 106 cases, 28 had initially been looked after by skilled nursing at home, in a hospital or nursing home, but had proved unsuitable (Table VIII).

To a larger extent than with other psychiatric conditions social factors are responsible for admission of the senile case to the mental wards. In this respect war appears to affect the well-to-do classes more than the poor, who even in peace time are only rarely in a position to look after difficult invalids in their own homes. Comparing the admission-rate of patients into the Royal Edinburgh Hospital for the pre-war and war periods, it can be seen that the percentage of patients over 60 years old only rose from 27·8 to 30·2 in the contributory wards, but from 29·3

TABLE III.—*Length of Residence in Craig House of Patients Over 60 Years Old.*

	Males.	Females.	Total.
Under 1 year	9	18	27
2–3 years	2	16	18
4–5 ,,	3	3	6
5–10 years	5	13	18
10–20 ,,	5	7	12
Over 20 years	10	27	37
Total	34	84	118

TABLE IV.—*Classification of Patients in Craig House Over 60 Years Old.*

	Male.	Female.	Total.
Senile, arteriosclerotic and presenile cases	7	15	22
Manic depressive cases	7	13	20
Involutional and senile melancholic cases	6	19	25
Schizophrenic and paraphrenic cases	14	37	51
Total	34	84	118

TABLE V.—*Diagnostic Grouping in Cases Admitted since January 1, 1937.*

Demented cases (senile, arteriosclerotic, and presenile)	125
Involutional and senile melancholic cases	58
Manic-depressive cases	29
Schizophrenic cases	11
Various conditions (toxic, syphilitic, etc.)	17
Total number of cases	240

TABLE VI.—*Number of Cases over 60 in Diagnostic Groups who were admitted in the years 1937 to 1941, and who remain in Hospital on July 1, 1943.*

	Admitted 1.i.37–31.xii,41.	Surviving in hospital on 1.vii.43.
Demented cases (senile, arteriosclerotic and presenile)	79	9
Involutional and senile melancholic cases	41	10
Manic-depressive cases	17	4
Schizophrenic cases	9	2
Various conditions (toxic, syphilitic, etc.)	10	1
Total number of cases	156	26

TABLE VII.—*Classification and Result of Demented Patients Over 60 Admitted to Craig House since January 1, 1937.*

	Discharged.			Surviving in hospital.	Deaths.				Total number of cases.
	Relieved.	Unchanged.	Total.		Within 1st week.	Within 1st month.	Later.	Total.	
Arteriosclerotic cases	14	1	15	9	4	9	7	20	44
Senile cases	4	1	5	10	3	7	29	39	54
Cases of presenile dementia (Alzheimer, Pick, etc.)	0	1	1	4	0	0	1	1	6
Cases of terminal confusional psychosis (insufficient evidence for further classification)	0	0	0	0	5	2	0	7	7
			21	23	12	18	37	67	111

to 43·2 in the private wards; there are no significant differences as regards the sexes. Probably difficulty in obtaining domestic help is the most important factor for this social difference.

In contrast to what used to be thought, the admission of senile patients to the mental hospital in no way precludes the return of some of them to their families in a more manageable state of mind, and all recent observers are agreed on this fact. The results as apparent on July 1, 1943, in 111 cases admitted since January 1, 1937, are shown in Table VII. Of 111 patients, 21 could be discharged back into the care of their families, 23 remained in hospital and 67 had died. These results are similar to those of Palmer, Braceland and Hastings, who report a social recovery in 30 out of 123 cases.

In our material it is again strikingly demonstrated how much more favourable the immediate prognosis is in cerebral-arteriosclerotic as compared with senile cases. Out of 44 arteriosclerotics, 15 could be discharged and 9 remained in hospital, whereas only 5 out of 54 senile dements could be returned to their homes. The criteria used in grouping our cases under the diagnostic headings of "Arteriosclerotic" and "Senile" are the ones which were re-tested, checked by post-mortem findings, and summarized by D. Rothschild (1941). There is a certain amount of intermingling of types, but most cases can be easily grouped, and this is important when the difference in prognosis of the two illnesses is kept in mind.

Management of Senile and Arteriosclerotic Cases.

The management of senile and arteriosclerotic patients can be reviewed from several aspects. In deciding the treatment of individual cases the patient's physical condition is of primary importance. Of 111 admissions, 30 patients died within a month from admission and 12 of these within the first week. The great majority of these patients had signs of physical illness on admission, as was also the case with many patients who survived for longer periods. Very often these conditions had not received previous treatment, and there is no doubt that improvement of any physical illness, heart failure being the most frequent one, is accompanied in many instances by striking mental improvement.

Most patients were undernourished on admission, but could be made to take sufficient food under supervision, as actual refusal of food was uncommon. Frank avitaminosis was rare; scurvy was observed in a senile dement who lived alone, and though he would cook his own food, used to leave most of it untouched for the benefit of his father and his wife, both of whom had been dead for many years. Treatment of senile dementia with heavy doses of vitamins has recently come to the fore. Wadsworth, Quesnel *et al.* (1943) discussed the results of treating 10 senile cases with the vitamin B complex, and compared the result with 10 control cases. Intensive treatment continued for two months, and while only one case in the control group could be discharged, four patients who had been treated ultimately returned home. There was no lessening of dementia as assessed by various psychometric tests, but the behaviour pattern appeared to be improved in the treated cases. The cost, however, of treating 10 patients for two months was 300 dollars. In this hospital vitamins were given along general principles of nutrition.

TABLE VIII.—*Aspect of Cases Immediately Responsible for Admission to Mental Hospital.*

(106 demented cases over 60 admitted to Craig House since January 1, 1937.)

Suicidal	7
Paranoid delusions	9
Confusional syndrome	47
Wandering	9
Violent and dangerous to others	9
No friends or relatives	5
Dirty habits	20
	106
Number of cases admitted after skilled nursing at home, hospital or nursing home had failed	28

In the provision of adequate sleep the quick-acting and rapidly eliminated drugs, like paraldehyde and nembutal, were preferred to others; luminal seemed the day sedative of choice in a few cases. Sooner or later these sedatives could be discontinued, and of the 22 demented patients in the hospital on July 1, 1943, only 3 required a regular night sedative, and 4 had occasional night or day drugs. Encouragement with reassurance, and even a little explanation, is of great value in the recovering arteriosclerotic psychotic, whose personality is so often quite well preserved, and who frequently becomes painfully aware of his position and shortcomings. The occupational therapy department is being attended by 5 patients at the moment, and a further 3 are able to read a little and to go out for walks. Of the 19 senile and arteriosclerotic patients, 10 are in better mental and physical condition than they were on admission; only 4 are bedridden, but 9 are always or occasionally incontinent.

It can be said that with the exception of occupational therapy in the narrow sense of the word, all the other measures in the patient's management could have been applied in their own homes, and in any case ought to become routine measures of prophylaxis in the care of the aged. In avoiding breakdowns necessitating admission to a mental hospital, early recognition and treatment of physical illness and provision of adequate nutrition as well as sleep are the main prophylactic measures stressed by D. K. Henderson, who also points out, however, that the patients, especially when deluded, are better nursed by strangers, preferably in special nursing homes. It is of interest to mention in this connection that in London there is a special hospital under the authority of the L.C.C. (Tooting Bec Hospital for Senile Dementia), to which senile mental patients can be transferred from general or observation wards without certification, and where they are looked after under favourable general hospital conditions. Interesting suggestions have been made recently for the social prophylaxis of senile mental illnesses; they range from the creation of social clubs for the aged to the building of special blocks of flats where old people can lead a community life.

ÆTIOLOGY.

The ætiology of "somatico-psychic disorders of old age" has recently been extensively discussed by Palmer, Braceland and Hastings (1943). According to the authors, in these disorders as in other psychiatric conditions multiple factors must be assumed. Immediate causes are physical illness, malnutrition, and avitaminosis. Psychological traumata, such as bereavement and the peculiar social position of persons during old age, should not be overstressed, and the authors point out that such afflictions have to be borne by almost all old people. For a psychosis to arise, the somatic defect in the brain must be present, but this again does not necessarily produce a mental picture. When mental illness results, some other factors must be assumed to be at work; Palmer, Braceland and Hastings suggest inherited tendency, chance location of the lesion in the brain, or some unknown pathogenic tendencies.

According to Rothschild (1936), the search for physical factors that might modify the normal ageing process and be responsible for the development of a senile psychosis has proved unproductive. In his clinical pathological investigation of 24 cases of senile psychosis there was a lack of correlation between the histological changes and the degree of intellectual impairment, and equally severe alterations had been found in the brains of old persons with normal mentality. These inconsistencies were attributed by Rothschild to differences in the capacity of different persons to compensate for cerebral damage. Cycloid and paranoid symptoms were regarded by him as being compensatory, and patients who simply demented were assumed to lack compensatory powers. It was found that strong compensatory mental reactions, analogous to Jackson's positive symptoms, were usually associated with compensatory somatic processes, such as cardiac hypertrophy.

An attempt has been made to consider, with the help of the material obtained during the present study, whether there is any evidence for constitutional predisposition in patients suffering from senile or arteriosclerotic psychosis. Some suggestive observations have emerged regarding heredity and pre-psychotic personality.

Hereditary Factors.

It seems fairly well established that senile dementia shows definite familial incidence. In 60 senile dements Meggendorfer (1926) found 18 cases of senile dementia occurring among blood relations, and he also reported a high incidence of various forms of other mental disorders in the families of these patients. Weinberger (1926) found a positive family history of arteriosclerotic and senile psychosis in 11 out of 51 cases of senile dementia. There were in all 35 cases where mental disorders had occurred in direct or collateral members of the family. These studies were based on very thorough researches into numerous families, whereas our material was collected by the method of ordinary case-taking only.

In 78 cases of senile and arteriosclerotic psychosis available for analysis positive family history for these disorders could be established in 12 cases (15·4 per cent.), and there was a family history of strokes without psychosis in 7 cases. In 25 out of 78 cases (32·1 per cent.) there was a record of mental or neurotic disorder occurring in parents, siblings, or near collateral blood relations. It was felt that our material was not sufficiently large nor the data reliable enough to allow any further analysis, especially investigations of the role of heredity in contrasting senile and arteriosclerotic cases. But, along with previous findings in this field, there seems no reason to doubt the importance of hereditary predisposition in the aetiology of psychosomatic disorders of old age (Table IX).

Personality Factors.

The observation that the patient's previous personality should be reflected in the symptoms of an organic psychosis has frequently been made. Henderson and Gillespie find that the symptoms often represent a caricature of the intact personality; to Scheid (1933) it seemed that in senility, character and personality appeared to become rigid along one of the many aspects which a normal personality can assume, possessing, as it were, numerous facets.

In our material the high incidence of abnormal traits in the previous personality of the patients is very striking (Table X). A record of the personality was obtainable in 79 cases, and of these only 30 had been satisfactorily adjusted individuals. Severe abnormalities of the personality, which included several cases with neurotic disorders before the involutional period, were found in 27 cases. Moreover, there appeared to be a definite positive correlation between previous psychopathic tendencies and the severity of psychotic symptoms as contrasted with dementia alone.

Reviewing the symptomatology of our case material, it becomes evident that the senile as well as the arteriosclerotic cases can both be subdivided into two groups: one in which the dementia is associated with numerous secondary psychotic symptoms, especially delusions of a paranoid nature and affective disorders, mostly in a depressive direction; and a second group in which the dementia is in

Table IX.—*Heredity.*

Incidence of positive family history of mental and nervous diseases in 78 cases of senile or arteriosclerotic mental disease:

Disease in parents	8 cases.
Disease in siblings, aunts, uncles, etc.	17 ,,
Total incidence of positive family history	25 cases (32·1%).
Negative family history in parents, siblings, etc.	53 ,, (67·9%).

Incidence of positive family history for senile and arteriosclerotic diseases in siblings of the same 78 cases, as well as of occurrence of "strokes" without psychosis:

Senile and arteriosclerotic disease (parents, siblings, etc.)	12 cases (15·4%).
"Strokes" without psychosis in family history	7 ,,
Total	19 cases (24·4%).

the foreground, any delusions are poorly developed, and the mood is labile. In the senile and arteriosclerotic cases who were mainly demented there was a much higher incidence of a normal previous personality than in those cases where positive psychotic symptoms were in the foreground and the dementia less evident. This subdivision into the above-mentioned clinical types and their correlation with abnormal personality is more obvious in the senile than in the arteriosclerotic group; 13 among 24 cases of "simple senile dementia" had a normal previous personality, whereas this was the case in 5 only of 20 cases of senile dementia with psychotic symptoms.

TABLE X.—*Incidence of Abnormalities in Previous Personality of 79 Cases of Senile and Arteriosclerotic Disease.*

	Well-balanced personality.	Some psychopathic traits present.	Severe abnormalities of personality.	Number of cases available for study.
Senile dementia with prominent psychotic symptoms	5	7	8	20
Arteriosclerotic dementia with prominent psychotic symptoms	3	5	8	16
Simple senile dementia	13	6	5	24
Simple arteriosclerotic dementia	9	4	6	19
Total	30	22	27	79

It is in no way intended to add to psychiatric nomenclature by mentioning four clinical sub-types; they merely represent four focal points in the numerous intermingling clinical pictures of senile and arteriosclerotic mental illness. The significance of these types and their relation to personality is best shown by quoting four typical examples:

1. *Simple Senile Dementia.*

Mr. C—, aged 85. The patient had a negative family history, and from helping his mother in business he gradually worked himself up first to music teacher, then elementary school teacher, and by passing additional examinations at the age of 50 he finally became a secondary school teacher. He had had a very wide range of interests and hobbies, was an excellent mixer, even tempered, and easy to get on with at home. His marriage had been a very harmonious one. He recovered well from a prostatectomy when aged 75, and there were no mental symptoms when his wife died a little later. For two years before admission memory defect and other symptoms of mental deterioration had been gradually increasing; for the last two months he had tended to wandering aimlessly, and for one week before admission he had become weaker but at the same time very restless, so that restraint was required to keep him in bed at night. On admission he was severely confused and visually hallucinated. Physically he suffered from congestive failure due to senile myocardial degeneration, and he died of hypostatic pneumonia six days after admission.

2. *Senile Dementia with Prominent Psychotic Symptoms.*

Mr. S—, aged 71. His father had died following a stroke, though mentally clear, but a sister had been in a mental hospital for six months when aged 50. The patient's previous personality had been unsatisfactory, in so far as he had been content to live as his brother's employee all his life, failing to make contacts or friends outside his family and remaining single. Speculation on the Stock Exchange was his only hobby, and he was very mean. All his life he had been markedly hypochondriacal, and during the years before his admission he had acquired a collection of over 100 homoeopathic medicines. Gradual physical and mental deterioration started six months before admission, and he became increasingly quarrelsome as well as frequently worrying about numerous real and imaginary peccadilloes. Finally he developed attacks of rage and confusion, and also unsystematized paranoid delusions; he thought that his loss of memory was brought about by violet rays and the heat of electric wires (patient was an electrician by trade). Physically he showed well-marked senile changes with slight arteriosclerosis, and since admission his moderate degree of dementia has progressed; his various delusions can no longer be elicited as his talk has become too incoherent. While at first he had been depressed in an irritable fashion, he is now consistently euphoric.

3. *Simple Arteriosclerotic Dementia.*

Mrs. W—, aged 74. There was a negative family history of mental illness and arteriosclerotic disorders in this case. The patient was a well-adapted happy woman, who, having

lost her husband six years after marriage, ran a bakery business and brought up two sons. She retired from business at the age of 68, and soon after this was noticed to become easily nervous and excitable, in striking contrast to her previous bearing. About four years later she had a stroke which resulted in left-sided weakness in face and hand, as well as in a certain amount of mental confusion; especially at night she seemed to imagine herself back in her childhood. For the two months preceding admission this confusion had become almost constant; she lived completely in the past, demanding to see her parents, and often mistaking her son for her brother. She became physically weaker, lost some weight and also became incontinent of urine. Her blood pressure was 180/110, and there was well-marked peripheral arteriosclerosis, as well as slight paresis affecting the left face and arm. She was euphoric, disorientated in every respect, and moderately demented. Apart from improvement in her physical condition she has remained at the same level during two years' residence in hospital. There has never been any evidence of delusions or hallucinations.

4. *Arteriosclerotic Dementia with Prominent Psychotic Symptoms.*

Mrs. J. W—, aged 72. Her father died of Bright's disease and her mother following a stroke; one of her siblings is suffering from "blood pressure," but there have been no mental symptoms in any member of the family. The patient brought up a large family and was fairly happily married. She was, however, very strict, obstinate and rigid in her outlook and with her children. She was supposed to have had feelings of inferiority about an operation scar (T.B. glands) in her neck, and failed to make friends because she was not sufficiently trusting. She was very house-proud and too careful about her money. Six years before admission she became depressed with suicidal ideas, after her husband's death, and three years later there was transient loss of power in a hand and later in a foot; she also had headaches and came under medical care for raised blood pressure. Deterioration of memory and other intellectual functions was noticed at that time, but showed a good deal of fluctuation. She was often moody, and during the last four months had had several attacks of confusion with visual hallucinations. Violence towards her daughter and general obstinacy led to her admission. In hospital she was very resistive; her blood pressure was not raised, but she showed marked peripheral arteriosclerosis and left facial weakness; she had several epileptiform convulsions. She died of broncho-pneumonia seven days after admission.

Material comprising 79 cases in whom the previous personality had been assessed in the course of routine case-taking, often from one informant only, is clearly not adequate for a further searching analysis. A variety of psychopathic traits were in evidence, but there was a strikingly high incidence of the so-called "obsessional" trends; rigid outlook, obstinacy, narrowness of interests, overconscientiousness, and bigotry; many of the patients had also shown poor adaptability to their social surroundings, and together with the socially disagreeable components of the "obsessional" personality may represent what Meggendorfer meant by "schizoid psychopaths," who formed about 40 per cent. of his cases of senile dementia. Similar traits were found in the pre-psychotic personalities of involutional melancholics by workers in that field (Titley, 1938; Palmer and Sherman, 1938), and this seems significant when keeping in mind how difficult the differential diagnosis can be between an involutional melancholia and a senile psychosis in which the degree of organic dementia is only slight in comparison with the positive psychotic symptoms. Also, involutional melancholics often deteriorate to a level at which it can be very difficult to be sure that they are not demented intellectually. Perhaps both disorders would become more understandable if regarded as the response of a similar type of personality to the changes that take place in the soma during ageing. The predisposed personality breaks up during this process, and "dementia of the personality" (Bumke) results. Dementia of the intellect could be considered to be merely a special form of the generalized deterioration, and might possibly depend upon certain types of pathological changes and certain locations in a predisposed organism.

Conclusions.

The present study, in conjunction with the findings of other workers, indicates that factors other than physiological and anatomical ones are responsible for the origin of senile and arteriosclerotic mental disorders. Old age alone does not produce mental illness; for this to occur predisposing constitutional factors must have been present in the patients, who frequently had shown their tendency towards nervous and mental abnormalities previously. For those who believe that mental hygiene and the treatment of early neurotic symptoms can prevent the occurrence

of more serious disorders later in life, there seems to offer itself a new field in the prevention of mental illness in old age. Again, if one believes that better social conditions and a happier world will decrease the incidence of neurotic and psychotic disorders and that the social improvement of the last 100 years or so will continue, then we can expect that in spite of the increasing proportion of elderly people in the population, the number of cases of mental infirmity during the involutional and senile periods of life will not rise at the same alarming rate. Even if we are more modest in our assumptions as to how much can be done by social planners and doctors in the prevention of mental diseases, it is hoped that by applying in a routine fashion the prophylactic measures outlined in the care of the aged, we can in many instances prevent the normal ageing process from changing into a psychosis with its social consequences.

My thanks are due for guidance and advice to Prof. D. K. Henderson, at whose suggestion this study was undertaken.

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PSYCHONEUROSES IN R.A.F. GROUND PERSONNEL.*

By Squadron-Leader D. N. PARFITT, M.D., M.R.C.P., D.P.M.,
Neuro-Psychiatric Specialist, R.A.F.V.R.

THE following report is based on 150 men treated in hospital, and 300 patients, 50 of whom were women, seen at a diagnostic and advice centre.

As a rule, stresses and precipitating factors were more obvious or easily discoverable than in civilian life, adverse situations were more superficial, diagnosis and treatment were easier. Anyone who has conducted civilian clinics finds the change-over comparatively easy. Nevertheless, much of what follows is applicable to civilian work.

Older or pattern reactions which are activated or reproduced by the separation from home, with all that that implies—different work, changed interests, economic problems, sex difficulties and so on—are overshadowed by recent stresses, such as service discipline, efforts to adapt to mechanical work, hardship and danger, and in practice it is frequently found that treatment aimed at resolving the immediate strains produces satisfactory results from the point of view of the continuation of service duties.

Responsibility as a factor acts both ways, the worries and problems of domestic management are often left behind, but promotion sometimes brings new trials, which stretch moderate abilities beyond their limits.

Physical factors due to age or vascular disorders must not be forgotten; they become increasingly important as the war years go on: any older men who were fit in 1939 have begun to develop symptoms consequent upon the changes of age in 1943.

INVESTIGATION OF PATIENTS.

It is wise to make a careful physical examination of each patient before the psychological investigation is undertaken, firstly because it adds authority to one's explanation of physical symptoms, secondly because the patient's behaviour under examination is often diagnostic, and thirdly because one meets every now and then a missed case of organic disorder, such as general paralysis, cerebral tumour or hypertension. The peculiar resemblances between hypothalamic and suprarenal disorders on the one hand and the manifestations of anxiety on the other must also be borne in mind. Anxiety in association with other factors may produce real organic changes. This was strikingly illustrated by the perforated peptic ulcers which followed soon after severe air raids (35), and 3 per cent. of anxiety reactions in this series had presented reasonable evidence of ulcer at some time.

The competent exploration for physical disease, which has often been undertaken in a general hospital before a patient is admitted to a neurosis hospital, is an advantage if it has been brief. The dangers of excessive investigation, however, are very real; not only medical officers, but various specialists are sinners in this respect. The ophthalmologist or the aurist reports nothing organic found and proceeds to order lotions, drops or inhalations. There appears to be a reluctance in every speciality, including our own, to yield up a patient to other hands. It sometimes happens that a patient's chances of recovery are dangerously jeopardized by persistent efforts to move forward along a blind diagnostic alley, and Cook and Sargant (3) have commented on this aspect. Hurst (19) stresses the fact that even the presence of organic signs does not explain psychological symptoms which are not normally associated with the physical changes discovered. This is particularly important in hysterical mechanisms, but is frequently forgotten.

* A paper read at the Autumn Meeting of the Northern and Midland Division of the Royal Medico-Psychological Association held at Derby on October 29, 1943.

For patients admitted to hospital the first estimation of the mental state is preferably undertaken the day after admission or as soon as practicable. It should be thorough and leisurely (12), and the physician should be alone with the patient. This interview customarily lasts about an hour, and in practice is much the most important interview. In quite a proportion of service cases no further interviews of any length are required, it being sufficient to assist progress with short talks while the ordinary methods of rest and occupation are continuing.

As a rule the physician can correctly estimate the probable course of the illness, and make an immediate decision about invaliding. If this is necessary it should be proceeded with at once; if not, it is made clear to the patient that treatment will be followed by his return to duty. Cases for invaliding who spend a long time in hospital are a bad influence.

During the first interview the family and personal history, with the civilian and service work records, are matters for particular inquiry (12).

Aetiology.

Neurosis develops from the interaction of stress and a predisposed personality. The ability to endure adverse circumstances, hardship or danger has been shown by events to be equally divided between the sexes, but the female service neurotic is more rebellious than the male, who has longer experience of discipline. Youth (28), good leadership and early treatment help to reduce the incidence of psychological disorders, and suitable amenities for recreation are important. In general, the prolonged, chronic situation is more productive of breakdown than acute psychic trauma. Sometimes a single terrifying experience initiates sensitization or conditioning, and subsequent slight stresses produce a chronic disorder.

The average age of patients is inevitably low. Sutherland (36) found it to be a little under thirty, and in the 150 hospital cases with which this paper is concerned it was even lower, the largest number of men being in the age-group 25–30. The 250 " clinic " men averaged 31·5 years, and the 50 women 25·5 years.

It has been suggested (36) that a larger proportion of N.C.O's. than would be expected from their numerical strength suffer breakdown. There were no officers among the hospital cases, but 22 per cent. of the out-patients were commissioned, 13 per cent. were N.C.O's. and 65 per cent. held the rank of L.A.C. or lower.

It has been noted that many of those who broke down joined the service for poor or inadequate reasons, but in these days of conscription, and because so many men find it difficult to express emotional ideas which move them, it must be difficult to speak with certainty on this point.

In Hadfield's cases (15) the illnesses of 60 per cent. were not attributable to service or only slightly so, and 40 per cent. were attributable or largely so.

Fairburn (10) suggested that traumatic experiences precipitate psychopathic reactions, activating latent factors. He maintains that all such reactions are based on an exaggerated degree of emotional dependence characteristic of infancy. He found this experience confirmed by his service material, where separation anxiety was the only invariable symptom. This description of psychoneurosis based on infantile reactions and separation from home is unlikely to be the whole story, because one often encounters an active avoidance of home and a long delay before symptoms develop, and because of the existence of more immediate and obvious factors. These facts could be explained by Fairburn's theory, but it cannot explain why so many cases continue their symptoms, and even become worse, when they are given home postings which enable them to live out with their families, nor does it explain similar attacks which were experienced at home before service began, nor the frequent indifference to home, remarkable for neither antipathy nor nostalgia, which has characterized the behaviour of some, ever since they reached adult years.

The form of reaction is probably influenced by infantile mechanisms, but in practice these can frequently be ignored and adjustments made by alleviating present troubles.

One very important fact emerges from a study of the 150 cases I have treated in hospital. The average duration of service before admission to hospital was 30 months. This two and a half years of service before breakdown is reduced in importance a little by the further fact that symptoms had been present for an

average of ten months before admission, except in the depressive reactions, where the duration of symptoms was slightly less, but for the most part patients had continued to work during the period of symptoms. This is strong evidence that refusal to try is not a main cause.

The clinic patients averaged 25 months' service among the men, excluding regulars, with a history of symptoms extending over an average period of nine months, excluding chronic cases. The 50 women had only averaged 11 months' service and had had symptoms for more than six months.

Roughly speaking these out-patients represent two main groups, a larger one of those less severely ill than the hospital cases, whose members are returned to duty, and a smaller group of those more severely ill than the hospital admissions, whose members are invalided. The patients sent to hospital were comparatively few, about 5 per cent.

Predisposition.

The constitutional make-up has always been regarded as important, but during this war its importance has been recognized very much more, perhaps too much. Gillespie (13) reported that 150 of 251 flying crew—60 per cent.—had predisposition at least marked, while 87 per cent. of 256 ground crew were considered severely predisposed. He gave figures indicating the reliability of estimates of predisposition. Compared with Gillespie's 87 per cent., previous emotional instability was found by Sutherland (36) in 80 per cent., and Hyland and Richardson (20) gave the same figure. Hadfield (15) described 82 per cent. with constitutional or psychological predisposition. These figures show remarkable agreement.

Heredity.

Heredity is usually considered in relationship to parents and sibs only. Sutherland found 53 per cent. of his patients with hereditary factors, and Hyland and Richardson 56 per cent. During the last war Wolfsohn (40) described neuropathic or psychopathic inheritance as present much more frequently in psychoneurotic patients than in controls. Lewis and Slater (25) include it among their bad prognostic factors, and Tredgold (37) found 21 per cent. of his depressives with a family history of nervous disease. In order to include a measure of multiple parental or sib psychopathic defect I have measured heredity by taking the average number of relatives affected in the various conditions. In this particular series the depressives scored 1·8, obsessionals 1·7, hysterics 1·5, psychopaths 1·4 and anxiety states 0·8.

Intelligence.

The hereditary endowment includes the level of intelligence. I have not included in the numbers considered here those patients whose outstanding trouble was mental defect, that is, patients whose mental age was ten or thereabouts. The Kent Oral Test was employed for rough estimation, together with the general clinical impression, so that exactitude was far from being attained, but there can be little doubt that many of the cases in this series were handicapped by a low level of intellectual capacity. 25 per cent. of the hospital cases had not reached the top standard when they left school at 14. About another 25 per cent. had been to secondary or technical schools, rather more among psychopaths and obsessionals and less among depressives, but the proportion who gained school certificates was small, the obsessionals doing best, the psychopaths worst.

Taken as a whole, only 15 per cent. of the 450 patients seemed to have had diversions apart from their work that I would estimate as average, taking into account athletic games as well as hobbies and artistic interests.

Curran (4) found 5 to 7 per cent. of his cases with a primary diagnosis of mental defect, and my experience agrees with the higher figure—7 per cent. Concerning the intelligence of neurotics, Halstead (16) found that as a whole they obtained a significantly lower score in the Raven Test than normals, making allowance for 5 per cent. in 2,500 with negative attitudes. Although more than 50 per cent. gave irregular scores, this scatter is less than in normals.

A mental age of 10 years and upwards is compatible with successful duty of an elementary nature provided additional neurotic symptoms are not pronounced

(4, 30, 32). They do best in graded groups, as in the special sections of the Pioneer Corps in the Army (8, 9), but we are not so well served in the Royal Air Force in this connection. It is important to recognize defect of intelligence before impossible demands are made upon it, but in practice one frequently finds that it has been missed and breakdowns unnecessarily precipitated. When the defective does break down, the symptomatology is similar to that in the psychoneuroses, with anxious and hysterical reactions predominating. Inability to cope with their work is plain in 40 per cent., and about 25 per cent. have police records. Dullness and nervousness are often very obvious. Less than 50 per cent. of my defectives confessed to poor school records, and only about a half to unsatisfactory work histories.

The Predisposition Score.

Gillespie and others in the R.A.F. have worked out a predisposition score, where adverse factors in the history are scored a point for each. Up to four is not of much import, but the outlook for recovery becomes progressively worse as this number is exceeded.

Some of these factors are :

(1) A broken or unhappy home during childhood. I found 25 per cent. of all hospital patients with this handicap, but among the psychopaths it was 50 per cent. Among out-patients the proportion was 15 per cent. for men and 30 per cent. for women.

(2) Physiological instability, under which are usually included bed-wetting beyond four years of age, temper tantrums, asthma, urticaria, eczema, skin and nose-picking after six years, and continued nail-biting and thumb-sucking, etc. More than 35 per cent. of my cases had one or more of these.

(3) Excessive visceral responses to minor ordeals, such as undue anxiety, nightmares, faints, sweats, tremors, tachycardia, stomach upsets and so on. 40 per cent. of my hospital patients gave such a history, and 20 per cent. of out-patients.

(4) Unhelpful personality traits, such as marked shyness, timidity, exaggerated non-aggression. The incidence here was over 30 per cent.

(5) Mood changes, including periodic solitariness, sulkiness and indiscipline, about 5 per cent.

(6) A history of phobias of various kinds. 30 per cent. of anxiety and obsessional cases reported such fears, and 15 per cent. of others. The out-patient figures were 20 per cent. and 10 per cent.

(7) Stammer, 15 per cent.

The points listed above are usually elicited from the childhood history. A few years later in the patient's story other portents may show themselves.

(8) A bad school record, 25 per cent. of in-patients, 15 per cent. of out-patients.

(9) An avoidance of dangerous or competitive games, something over 50 per cent.

(10) The development of obsessional traits, without the development of an obsessive-compulsive neurosis, 5 per cent.

(11) A poor work record, either stagnation in low-grade employment or a restless flitting from job to job.

10 per cent. of Sutherland's cases gave such a history, 15 per cent. of my cases, but nearly 30 per cent. gave a history thought to represent a work record better than average. 40 per cent. of the women had poor work records.

(12) Previous nervous breakdown. This is obviously of the greatest importance. Love (26) found 12·7 per cent. with a previous circumscribed nervous illness, and 21 per cent. more with a history of psychological symptoms. This total of 33·7 per cent. is close to Sutherland's 36 per cent. showing abnormal reactions before service. Of my cases, anxiety states and hysterics had 15 per cent. (women 25 per cent.), but depressives, psychopaths and obsessionals 40 per cent. Other factors sometimes of importance are an unusual degree of lack of stamina and aggression, and a post-pubertal mother attachment.

The facts and figures already given make striking reading. They must be minimal figures, because it is inconceivable that investigators have always had time to make their combing exhaustive. The difference in my figures between in- and out-patients is probably a reflection on the increased time available for in-patients.

It is reasonable to suppose that the more completely the past histories are known the more closely would they correlate with present breakdowns, and this in itself should not be surprising.

The fact that such estimates cannot be final brings up the question of their reliability. Culpin, in his *Recent Advances in the Psychoneuroses*, draws attention to the wide variation in memory concerning childhood, which may be clear back to three years, or hazy even about conditions at eleven years. The completed questionnaires made by entrants to certain branches of the R.A.F. bear little relation to histories obtained after breakdown. Printed questions would certainly have to be presented with skill and tact if they were to yield information of value. Memory functions selectively; answers given are conditioned by the attitude and purpose of the moment, deliberate lying apart. Even the usual personal interview cannot entirely get over this difficulty. A man's attitude to his past when he is seeking entry to a certain branch and again when he is seeking to leave that branch changes remarkably, and will change again if he applies for a commission. Lately one has met a few men whose attitude to themselves is dependent on a growing urge to get out of the services and prepare for the post-war world.

Another difficulty, which, if it grows, will be a menace to accuracy, is the gradual spread of knowledge about these matters. Recently a patient of mine replied to a simple question concerning his parents with the following speech, as nearly word for word as I could get it down: "My father had shell shock in the last war and is a chronic rheumatic. My mother is absolutely neurotic; she worries a lot about nothing and is very nervous. I was always very nervous myself, especially of heights; even now a few feet up is enough to upset me. I wet the bed to twelve years of age and was afraid of the dark—always had to have a light on at nights up to thirteen or fourteen—had nightmares, always felt snakes creeping up my legs. I was awkward; used to fight terribly with my young brother, although we are good pals now; I was inclined to say half a word and stop, then repeat myself—I still am. I was no good at games—was afraid of getting hurt." In fact this man had played games in the first team of his secondary school, his father's shell-shock was first diagnosed 20 years after the last war, and so on. He was an over-serious lad who had done fairly well in aircrew.

Judgment of the probable behaviour of a man under stress has to take into account the good traits (25, 29). Many men are weighted by a high score of adverse factors, but are kept going by a good character or by inspiring leadership or other influences.

In a small group of 20 cases examined by me at odd times, for commission purposes, for upgrading from a lower category to a higher one, or as candidates for aircrew, all of whom had nervous symptoms or signs, the predisposition score varied from 1 to 10 and averaged 5, yet every one of these men had been for at least two years, and still was, holding down a job successfully. A few had been invalided from the service for nervous ailments before the war, but had joined at the outbreak and never faltered. It would be unjustifiable to deduce too much from this small group, but it is clear to me that very much more information is required about the proportion of men with bad histories who do well. Careful inquiries along these lines could be initiated by school medical officers later on, in preparation for the next war. Having raised predisposition to a place of such importance, it is essential to discover what the average man can do despite it.

Precipitating Factors.

Compared with the acute reactions developing under conditions of active warfare, precipitating factors severe enough to pass the test of common sense were rare. Between 5 and 10 per cent. of patients had suffered bombing or dangerous threats. Domestic difficulties and financial problems or other adverse factors were more common. They were present in about 50 per cent. of depressives and obsessionals, in about 25 per cent. of anxiety reactions, but in only 15 per cent. of hysterics and psychopaths; out-patient percentages were distinctly less. The nervous symptoms followed injury or physical illness in 30 per cent. of the hysterics and in 10 per cent. of the other psychoneuroses, including the psychopaths. Service abroad or the threat of a foreign posting was the immediate precursor in about 10 per cent. of hysterics and inadequate personalities generally. Overwork may have

been a cause in something less than 5 per cent. Ear, nose, throat and teeth examinations with specialists' reports were common, but sepsis could rarely be involved in the clinical picture.

In the main the chief precipitating factor was the inability of the patient to adapt to service conditions generally. This experience tallies with the report of Hyland and Richardson (20), who found this latter, general failure, to apply to 45 per cent. of their cases, with domestic worries in 33 per cent. and fear of enemy action in 22 per cent. Age, disease and trauma were lower in their list, and last of all came love problems, present in 3 per cent., which would appear to put love in its place.

Diagnosis.

The varieties of reaction met with are the usual psychoneurotic forms found during peace, but reported in different proportions in wartime by successive writers. An exception must be made of the acute battle stress cases, which have been handled so successfully by some of our colleagues. Some are seen from time to time in aircrew personnel and under other circumstances, but in general they are noteworthy for their absence, such clinical features as stupor, prolonged mutism, acute confusion and wild primitive behaviour being seldom encountered. Nor are exhaustion, bombardment, terrifying experiences, hardship and continual emotional trauma important in aetiology. Although these cases and the ordinary breakdowns which we see in service hospitals and clinics in this country grade into one another, I think it best to keep them apart for purposes of analysis.

It is convenient, and I think necessary, to attempt a classification of patients, but too much reliance cannot be placed on the figures of any single observer, because mixed psychoneurotic reactions are so common that diagnostic labels vary widely from one physician to another.

Hysteria.

There is reasonable agreement about the incidence of hysteria as a main diagnosis in hospital cases, which is in the region of 20 per cent. Figures published include 17 per cent. (32), 16·8 per cent. (1), 18 per cent. (20), 24 per cent. (15), and 15 per cent. (4), and my own figure is 16 per cent.

These estimates warrant the opinion that the conception and diagnosis of hysteria is fairly uniform. Curran (4) found only 4 per cent. among officers, where the incidence is lower, as expected.

Of my out-patients, 35 per cent. of men were hysterics and 10 per cent. of these were officers, compared with 30 per cent. of anxiety states, of whom 40 per cent. were officers. Of the officers as a group, 55 per cent. were anxiety states and 15 per cent. hysterics, but hospital figures would probably show less hysterics. Of the 50 women seen as out-patients, 37 were hysterics,—74 per cent. Making allowance for the small number concerned, it is highly probable that women are very prone to hysterical reactions under service conditions. None of these hysterics were officers, but two of six with anxiety states were officers. It is possible that this is associated with an incomplete acceptance by women of the idea of compulsory national service. In 10 per cent. of the women one met wilfulness, rudeness and downright rebellion in association with hysteria or near malingering. A few had a police record. 7 per cent. of men hysterics were disgruntled, but not so openly as the small section of women mentioned.

These figures for hysteria are much higher than are commonly found in peacetime clinics. Anderson (1) compared it with 6·5 per cent. of 2,857 pre-war Maudsley cases. This increase is linked with the profusion of situations favouring escape mechanisms that develop during war. As compared with the last war, however, the incidence of hysteria is considerably lower, with a corresponding increase in anxiety states (4, 15), and perhaps of depressions (4). A further compensation for the fall may be found in the frequency with which hysterical mechanisms are added to anxiety states, depressions and other reactions (12, 27), thus 15 per cent. of my depressives and 10 per cent. of anxiety states had hysterical symptomatology.

Reasons which may contribute to this changed incidence are:

(1) That hysterics are caught earlier and kept going by unit medical officers

with or without an opinion from a neuro-psychiatric centre. My own figures suggest that this is a main cause.

(2) That underlying anxiety in hysterics during the last war was not noticed so often.

(3) That there is a higher sense of national duty in this war, with a consequent elevation of morale.

It is unnecessary to detail the characteristics of hysteria, but Janet's conceptions are worth recalling. The hysteric has learned to speak, has acquired beliefs, has developed the ability to think, but remains egoistically puerile and has the child's selfishness. As an egoistic liar the hysteric is lazy, but capable of passionate faith in the justice of his cause and ready to lie unhesitatingly to avoid work and danger, often having ample drive and energy for his own purposes. He lacks morality, conscience and the sense of duty which drives man to conquer his laziness. In criticism of this conception I wonder whether the hysterical defect of character, with its special pleading and distorted reasoning emanating from an adult viewpoint, deserves the excusing word childlike.

Conversion symptoms were present in about 15 per cent. of the hysterics and the symptoms followed injury or disease in 25 per cent. of cases, much more frequently than in other psychoneuroses. In my cases faints, blackouts or somnambulism occur in the histories of 50 per cent. of hysterics, but in only 5 per cent. of other reactions. Coarse tremor and tics, in 15 per cent., were also much more commonly found in hysteria. A complaint of lack of concentration, made as if it were a separate and peculiar affliction, was met with in a large proportion. One may meet episodes like amnesia in 5 to 7 per cent., imitation of various diseases or a generalized expansion of behaviour directed to securing attention and recognition. Insomnia is complained of by one in each four, compared with one in two of other neurotics, and if a watch is kept for genuine sleeplessness the difference is even greater. Pains in the nature of various rheumatic and fibrositic complaints are met with in up to 25 per cent., compared with less than 10 per cent. in other conditions. Anaesthesiae and paraesthesiae are common in 15 per cent. 5 per cent. have a psychogenic imitation of chronic bronchitis. About another 5 per cent. threaten suicide: attempts are usually theatrical, but rarely, in a welter of anger and self-pity, an attempt is carried to the point of being dangerous to life.

In women, difficulties of adaptation and emotional excesses are common, and 15 per cent. or more suffer excessively during the menstrual period, with or without fainting.

If hysteria is not considered a form of constitutional psychopathy, the diagnosis from psychopathic constitution in the milder eccentrics, over-serious religiose personalities, garrulous hypochondriacs with well-marked hysterical symptoms, may be difficult. About 10 per cent. of my cases might have been included under the heading of inadequate psychopaths.

An intelligence less than average is probably most often met with in hysteria. This should be remembered, especially when dealing with women. I can recall a small series of four smart girls, attractively got up and with plenty of boy friends, whose faints, emotionalism and tempers in the face of duties beyond their compass derived from an intelligence quotient of about 80 per cent. I think the diagnosis of mental defect in such women is more easily missed even than in men. It is hardly necessary to add that the search for absent palatal and conjunctival reflexes is better omitted.

Malingering.

In at least 30 per cent. of my hysterics malingering complicated the picture. Observations of kicked tendon reflexes without the tendon being hit, silly collapses without physical signs, obviously fabricated tremors and unsteadiness approaching buffoonery, stiffness of joints depending on the spread of guarding for an hysterical pain, ridiculous contradictions, such as an extreme degree of weakness of toe and ankle movements when walking is almost normal, and so on, are frequently made. Some are almost unbelievably simple, although not necessarily malingering. One man had paralysis of the left arm, but could keep it in any desired position, and slowly and steadily return it to rest at his side when left for a few minutes with his arm elevated. Brussel and Hitch (2) found 7 per cent. of malingerers in neuro-

psychiatric service clinics, but considered them all constitutionally inferior and better invalided.

Anxiety States.

There is no agreement in the diagnosis of anxiety states comparable to that found with hysteria. Percentages recently published vary from 14 per cent. (32) to 53 per cent. (15) and to 75 per cent. (20). My own proportion was 41 per cent. for hospital patients and 30 per cent. for male clinic cases, with only 12 per cent. of women.

Anxiety is such a uniform response to difficult situations that it is a matter of personal predilection at present as to how often the diagnosis is made. Rosenberg (32), for instance, lists with his 14 per cent. of anxiety states 40 per cent. of hypochondriacs, and one cannot help wondering whether many of these latter would have been excluded by others as psychopaths, even if they showed no evidence of anxiety.

A pertinent point here is the distinction between anxiety neurosis and anxiety state. In about 11 per cent. only of my cases of anxiety was the reaction so woven into the patient's life as to justify fully the diagnosis of anxiety neurosis, but this figure is largely arbitrary, and I do not believe that any valid distinction can be drawn, because along the mile from the deep-seated anxiety neurosis to the episodic panic occasioned by a single experience there is a case for every yard. The results of treatment in the more superficially conditioned anxiety states are so good, however, that I feel we must draw a rough practical distinction between them and anxiety neuroses.

The well-known signs of the fright reaction are not necessary for the diagnosis of anxiety although they are often found. In this connection one still sees patients who have had a thyroidectomy performed with no benefit whatsoever. If an obvious hysterical manifestation is combined with an appearance of illness, tachycardia, fine tremor and increased sweating it is probably wiser to diagnose anxiety state with hysterical symptoms.

Most of the illnesses precipitated by terrifying experiences were concentrated in the anxiety group, where 25 per cent. had suffered such trauma. Service abroad and difficulties with work were fairly common. Over 50 per cent. of cases had had symptoms of any severity for less than three months. In 4 per cent. of the cases the illness took the form of recurring panic attacks. 3 per cent. were at some time though to be suffering from Graves' disease. Between 5 and 10 per cent. had exhibited conduct disorders, increasing alcoholism or very excessive smoking as complications of their condition. Frequency and urgency were occasionally met with. 5 per cent. had service grumbles.

In those where the work was unsuitable, remustering was recommended in about 5 per cent.

Depression.

The incidence of depression is variously reported. Hyland and Richardson give 4 per cent. (20); my own figures are 15 per cent. for hospital cases and 9 per cent. for clinic cases. Variation will first occur in proportion to the number of cases considered severe enough to warrant mental hospital treatment—the more of these, the less would find their way into a hospital for psychoneuroses. The suspected danger of suicide is often a governing consideration.

There is a growing tendency to divide psychoneurotic reactions into two main groups, hysteria on the one hand, and so-called affective conditions—anxiety and depression—on the other. This has proved useful in practice because the degree of firmness called for in hysteria would not be justifiable in affective reactions, where firmness has usually been self-applied.

Curran and Mallinson (5) and Tredgold (37) suggest that there is little difference between the endogenous and the reactive or psychogenic depressions except the difference of degree. Tredgold has described cases changing under clinical observation from anxiety to depression and back again. Curran and Mallinson do separate 44 endogenous depressives from 44 reactives, and the former show a greater frequency of previous breakdowns and affected relatives. These matters are of some importance.

It has been stated by Hemphill (17) that the war has produced no great increase in certifiable insanity, and I believe there is other evidence for this contention. I have the impression that there has been a considerable increase in psychoneurotic reactions; certainly in the services nervous reactions swamp the psychoses. If this is true it calls for an explanation, and one explanation is that manic-depressive psychoses, together with schizophrenia, are organic disorders, the increased incidence of which, under stress, would be comparatively slight; not non-existent, because the chief organ facilitating adaptation is affected. Rosenberg and Guttmann (33) studied the reactions of chronic Maudsley neurotics to war conditions. While the hysterics, obsessionals and hypochondriacs were unchanged, the depressives and anxiety states were considerably worse. Is one to deduce from this that mild depressives are adversely affected but more serious cases remain unchanged?

My present belief is that endogenous depression has no connection with the psychoneuroses and is best treated by physical methods. How far the psychoneuroses are based on defective structure it is impossible to say, but they are at present much more amenable to a psychotherapeutic approach, and for practical purposes can be treated as mental reactions to environmental stresses. This belief necessitates the further opinion that the organic basis of depression, the effect of which may be latent or apparent in the personality, varies considerably in its degree. When it is of an advanced order it is responsible for pure endogenous depressions; in milder forms it colours psychoneurotic reactions developing out of psychological stress. This conception renders comprehensible an overt anxiety state, which becomes masked by the deepening of a depressive attack or appears as a depression lifts. Many of the reactive depressions I have seen were superficial manifestations in hysterical personalities. The results of electric convulsion therapy in such cases are disappointing.

In my present depressive cases a pure depressive reaction was practically never seen. The majority appeared to me to have a degree of endogenous element affecting the picture of a psychoneurotic reaction. The depth of the endogenous depression could be roughly measured by the degree to which the zest for life had diminished, by the extent of the hopeless struggle to manage the daily work, noticed sympathetically by their friends, by retardation, self-reproach, paucity of ideas. Sometimes one observed the recent development of obsessional ideas, and many gave a history of previous circumscribed breakdown of a similar nature. Suicides were more common in the family histories. In an endogenous depression of any degree concentration is uniformly impaired. Many were moody or solitary in childhood and disliked school. 15 per cent. of my cases expressed ideas of reference. Feelings of unreality and impairment of memory were further complaints.

On this basis one found that the psychoneurotic reaction, anxiety and restless dissatisfaction were present in 30 per cent. and the proportion of headaches and insomnia were similar to those found in the psychoneuroses generally—about 40 per cent. 20 per cent. exhibited hysterical manifestations, 10 per cent. expressed hypochondriacal complaints, 10 per cent. had been drinking more than usual.

Obsessive-Compulsive Neurosis.

The incidence has been reported as varying from 1 per cent. (20) to 8 per cent. (15). Obsessional traits are not enough for this diagnosis to be made. One meets every gradation from pernickety tidiness to a paralysis of volition by unconquerable doubts. Only where the obsessive or compulsive symptoms are the dominating features of the illness is the diagnosis made, and the proportion was found to be a little over 5 per cent. In most cases the obsessional temperament had strongly coloured the patient's attitude to life, at least for many years.

The most striking association was with depression; about a half of the cases were acutely depressed when seen and could have been described as depressive reactions in obsessional personalities. In about 15 per cent. anxiety was prominent. The obsessionals showed with the depressives a greater frequency of psychotic colouring, a higher proportion of affected relatives and a commoner history of previous breakdowns than was found in other psychoneuroses.

Over 40 per cent. had been shy or timid during childhood. Between 5 and 10

per cent. had been definitely overworking, and almost 5 per cent. had succumbed to responsibility.

Nearly 15 per cent. had micturition difficulties if awaited or watched. Otherwise the usual obsessional fears of war horrors, venereal disease, dirt, snakes, rats and so on occurred, as well as recurring complete loss of confidence, even to do such simple things as to read, sometimes. Touching, counting, repeating, fantastic rituals and devastating doubts of all kinds were allied to over-scrupulousness and pressure of activity or anxious inhibition. Two cases were associated with hyperpiesis. About 35 per cent. of clinic cases were officers, otherwise ranks were lower than average.

Psychopathic Personality.

Hyland and Richardson (20) reported 25 per cent. of their psychoneuroses as psychopaths, dividing their cases under this heading into those temperamentally unstable and those with sexual abnormalities or drug addiction. 12 per cent. of my hospital cases were labelled psychopaths and 11 per cent. of the out-patients, but nearly 20 per cent. of other psychoneuroses showed a degree of constitutional inferiority or temperamental instability which might have led other physicians to term them psychopathic personalities.

Psychological abnormalities should have been present since childhood or at least since adolescence to justify the diagnosis. The term is an extension of the old one of moral defect. Silverman (34) found 80 per cent. of his criminal cases had cerebral dysfunction as evidenced by abnormal electro-encephalograms, particularly in the frontal area. Leucotomy has been tried for some cases. Silverman also found a history of unhealthy psychological influences on childhood, especially difficulties with parental relationships, in 80 per cent. A diagnosis by exclusion should be avoided. My cases could be divided into:

(1) Constitutionally timid, apprehensive individuals of inferior endowment mentally and often physically. They were chronically affected by worries concerning their mental or physical feebleness and had no confidence: 40 per cent.

(2) Unstable personalities who had, off and on throughout their lives, exhibited asocial conduct and behaviour disorders, often of a troublesome and aggressive nature: 20 per cent.

(3) Schizoid psychopaths. The diagnosis from schizophrenia rested on the presence of a basic weakness of character of a schizoid type, with moodiness, asocial attitudes, oddity, paranoid ideas, peculiar impulsiveness and bizarre conduct, which was largely unchanging and had not led to deterioration or developed into a psychosis. Increases in symptoms under stress were of the psychoneurotic kind, anxiety, headache, fatigue and so on. The malady did not progress except in so far as increasing complications followed the social results of abnormal conduct. Pseudo-artistic activities and interests in astrology, spiritualism and yoga were common. On the whole they were older than the average schizophrenic: 20 per cent.

(4) Sexual abnormalities of long standing. The only variety common in this series was homo-sexuality. Cases could be divided into four groups.

(*a*) Full homo-sexuality. Taking up all sexual desire from the time of pubertal development. Predisposition as measured by other traits is slight. Symptoms arise mainly from social and legal difficulties.

(*b*) Mixed sexuality, homo-sexual by training and induction, with physical and mental characteristics reminiscent of the opposite sex.

(*c*) As in (*b*), but without obvious evidence of inversion.

In these two groups neurotic predisposition is moderate and greater than in (*a*), and there are symptoms not arising from homo-sexuality. Some of these, especially of group (*c*), recover, especially if skilfully treated in an early stage, and lead reasonably happy married lives.

(*d*) Homo-sexuality as a symptom of a deep psychological or nervous disorder, where the inversion is merely incidental or accidental in a serious and chronic illness. The predisposition to neurotic illness is severe. Near-psychotics, especially depressives and extreme psychopaths, figure largely. Invaliding is not based on homo-sexuality as such, but on the total picture and the degree of adaptation or aggression (32).

Of the psychopaths taken as a whole, most showed symptoms strongly suggestive of other psychoneurotic syndromes. 15 per cent. had been in the hands of the police at some time or another. 15 per cent. of clinic cases were officers.

Anxiety-Hysteria.

Besides the five groups already touched on, there was a group of cases with such tantalizing mixtures of anxiety and hysteria that I could not make a primary diagnosis, and had to label them anxiety-hysterias. They numbered 11 per cent. of hospital cases and 8 per cent. of clinic cases. They may correspond to Hurst's emotional hysterics, among whom he found 90 per cent. with insomnia and depression.

I have not found it necessary to diagnose neurasthenia, hypochondriasis, effort syndrome and other clinical pictures. Cases to which such labels could have been applied seem to me to fit into the psychoneurotic reactions already mentioned.

Stammer.

Hurst (19) found stammer commonly associated with anxiety, and developing most frequently in men who had had it in childhood. It is much more commonly seen in the forces than in civilian medical practice. Despert (6) encountered it rarely in the New York Child Guidance Clinics, finding only 27 cases in 1941, whereas in New York in the same year 5,000 cases were notified to the Board of Education. Ward (38) states that 1 per cent. of all school-children are affected and the symptom is much commoner in boys, whose emotional outlets are restricted. Despert described stammer as predominantly clonic or tonic, the latter being more frequent, but the varieties are often mixed. The disorder is often associated with mannerisms of face and arms. This author maintains that in most cases stammer was noticeable between two and three years of age, and the symptom arose where the parents, particularly the mother, were perfectionist disciplinarians, over-anxious about the child's progress. She pointed out that between the ages of one and three a child changes its diet from fluids to solids, acquires the art of self-feeding, learns to walk and to form sentences and acquires elimination control. Ward says the trouble begins between three and five years most frequently, but often the onset is delayed until the second dentition or until puberty. Recent work (7, 23) based on electroencephalographic studies has suggested organic abnormalities in the occipital region, but the outstanding fact that the stammer is usually only present in company must not be forgotten in this connection.

In most of my cases there were numerous other psychopathic traits and neurotic symptoms. I could not associate any particular kind of personality with the stammer; it was most often an hysterical symptom, arising out of anxiety, and in quite a number was associated with an obsessional personality. About 40 per cent. of obsessionals and hysterics had had stammers as children, compared with 20 per cent. of others. About 15 per cent. of obsessionals and hysterics showed speech hesitation or stammer at the time of the first examination, compared with about 5 per cent. in other psychoneuroses. The childhood stammers were placed later than the ages given by Despert and Ward, but this was probably only an indication of how difficult of recall the adult finds his childhood memories, particularly in point of time.

Fatigue and Effort Syndrome.

This is a clinical syndrome, not a disease. Even if the same thing were said of anxiety, there is no point in increasing the number of indefinite headings. Quite early in the war this fact was placed on a firm footing. Fatigue and breathlessness are commonest in—

(1) Anxiety states. It was present in 10 per cent. of my cases, but Lewis (24) recorded it in 31 per cent.

(2) Hysteria: Lewis gives 11 per cent.; I found 15 per cent.

(3) Psychopaths: Lewis gives 18 per cent.; I found 20 per cent.

(4) Depressives: Lewis gives 12 per cent.; I found 25 per cent.

Jones and Lewis (21) found 50 per cent. of all effort syndromes depressed. Lewis also mentions post-infective neurasthenics, and I have met it in 15 per cent. of

obsessionals. Wood (41) prefers the term Da Costa's syndrome to effort syndrome. He found each of the following in over 70 per cent. of patients, not necessarily in the same patients: Palpitation, excessive perspiration, nervousness, dizziness, left thoracic pain and headaches, as well as fatigue and breathlessness.

Flushes, paraesthesiae, trembling, cramps, pulsating vessels and dry mouth were noted in more than 50 per cent. We have here a list of the usual symptoms of anxiety.

Wood (42) points out that they resemble fear reactions, where fear produces central stimulation, which leads to emotion and the symptoms and signs follow. Jones and Lewis (21) reported that 76 per cent. of their cases had conscious fear and 72 per cent. anxiety attacks at rest.

The diagnosis of effort syndrome, or a synonym of it, is made by the patient after false interpretation of his symptoms. Wittkower, Rodger and Wilson (39) described fatigue states based on resentment due to experiences in early childhood, with parental problem relationships (18, 34)—a situation very common in psychopaths generally. The same authors describe cases with a rigid outlook on discipline, whose superficial morality was strong and marked by an obsessional attitude and with a fear of showing fear. These could be viewed as fatigue states in obsessional personalities. Examination of effort syndromes as a group shows the same predisposing factors and mixed symptoms which are found in the respective psychoneuroses, except for the prominence given to the fatigue by the patients, and particularly by hysterical patients.

Treatment.

Treatment has to be conducted with the needs of the service in mind. A complete change of employment cannot be freely recommended.

Cases are seeded before admission to hospital at psychiatric centres and where possible hospitalization is avoided. Where in-patient treatment is going to be necessary, however, it is best given early, and judgment is necessary, not only from psychiatrists, but from unit medical officers also. There is still room for further education of those who see the patients first (26). The turnover is rapid in hospital, the average duration of stay being a little over three weeks for all types except the depressives, who average five weeks. This compares with Curran's average of a little over three weeks (4) and Sutherland's seven weeks (36). Results have been shown to be better with a quick return to duty, often combined with judicious leave. Many patients do better with leave than with hospital treatment, and despite the difficulties that arise when different periods of leave are recommended, this is a valuable procedure. If delay is occasioned by special investigations their purpose should be explained, as psycho-neurotics react badly to tests and examinations which are a complete mystery to them.

If invaliding is decided upon it should be carried out quickly; patients awaiting their tickets are not a good influence. Escapism is a real danger (20). There is a great difference between excluding men from the services because of nervous illness and invaliding them for the same illness. The former process could be more ruthless with advantage, but once in, discharge must not be too easy. Since many cases who are invalided do not need further medical treatment, it is doubtful if an elaborate system of passing such cases on to psychiatric civil units is necessary, but it would help if practitioners understood that a full report can be obtained from the hospital with the man's permission where this is necessary.

Psychotherapeutic treatment usually follows the lines of simple exploration and persuasion (12, 15). Many are treated dogmatically, but when it is considered probable that several interviews will be valuable, it is essential to gain the patient's confidence and keep him talking. Long explanations before they have begun to open their hearts merely mean that their inner worries are never heard. The physician's attitude can easily be suited to gaining a superficial transference, and early antagonism should be studiously avoided. Roughly the aim of therapy is to persuade the patient to appreciate his disability in psychological terms. Where the conflicts are so deep-seated that prolonged therapy will be necessary, it has been found advisable to invalid the patient so that treatment can continue while the ordinary vocations of life are followed. For this reason psychological investigation must be such as to leave the door still open for more detailed treatment by a

civilian psychotherapist. The atmosphere of a service hospital is not often conducive to long-term psychotherapy. The patient becomes an odd man out in a rapidly changing human environment; it becomes increasingly difficult to refuse him privileges that have still to be denied to other observant claimants, and the routine of occupational therapy, games and amusements, soon palls.

In most recent anxiety states the symptoms can be divided into two groups: firstly the results of the original conflicts which are the basis of the illness, and secondly the symptoms arising from rumination over the original symptoms themselves. For example, tachycardia may be induced and complicated by fear of heart disease. Symptoms of the second group can be usefully ameliorated by persuasion and explanation if one remembers that the essential core of the disorder remains untouched. This degree of help, however, is very often sufficient to enable the patient to strike a balance with his psychoneurosis and to resume duty successfully.

I think the value of this quick overhaul and rapid removal of troublesome symptoms will be increasingly realized in civil practice. If wards were available in general hospitals, where accessory methods of treatment, such as prolonged narcosis and electric convulsion therapy, were employed, with superficial psychotherapy, and where a sufficiently thorough physical investigation could be undertaken at the same time, excellent results would be achieved provided the department was linked to facilities for analytical treatment. Only in this way could analysis cope with the pressure which will increasingly develop.

Hysterics are best treated summarily at their stations (20). The chronic conversion hysteric is a problem. Collapses, faints and paralyses do not help the general atmosphere, and some of those who have had their disability for months are far from easy to improve, especially when there is a substantial original injury for the patient to work on. A separate hospital would be better for them. Firmness is essential in their management, not combined with condemnation, but rather with a realization of their essential weakness of character. The hysterical personality with a good intelligence can still malinger pretty successfully. It is not too hard to get private consultants in other spheres, and even in psychiatry, to provide certificates, the contents of which are known to the patient, recommending invaliding. I wonder sometimes whether publicity is not needed to make the general public acquainted with the hysterical personalities, who manage still to get far more sympathy than is good for them or for the community. I have no doubt that very many of the service cases will make their presence known in no uncertain fashion in the years after the war. One has to watch for the bargain strikers, who hint at various advantages which would do them a power of good.

Home postings are often a failure, but they are sometimes essential if a man's services are to be retained. In something over 5 per cent. a strong recommendation is made for a change of work.

Sedatives.

Sedatives have to be employed for sleeplessness. Nembutal, two capsules on an empty stomach at 10 p.m., or medinal, gr. x, are favourites. Luminal is best prescribed gr. 1 *b.d.* if it is given at all. I have almost given up using bromide alone, and rarely prescribe it with chloral. Two evipan tablets sometimes help the man who finds difficulty in dropping off, but sleeps well afterwards.

Narcosis.

The value of narcosis for the acute war neuroses is now firmly established, which is a satisfactory tribute to a form of treatment which has been often undervalued. It has been used successfully for depressive conditions (5, 15, 37), and I have found it very satisfactory. For anxiety states and other psychoneuroses of longer standing than acute battle cases I have not found it of much help.

Narco-analysis.

The use of pentothal intravenously for facilitating analysis is a personal choice of those physicians who find it effective. There is little doubt of its value in very acute cases. In the types of patients I have under my care it has not helped me much. Some writers make a great deal of abreaction, but here, again, I have

been disappointed. I have seen patients benefit from emotional catharsis during treatment, but abreaction as usually described I have only seen once or twice, and it did not appear to produce benefit. Jung (22) found abreaction of little use where there had been only a minor degree of precipitating trauma, and he quotes McDougall, who found it sometimes harmful as well as useless. Even where trauma occurs, psychological difficulties have often existed for a long time before.

Occupation Therapy.

This, including gardening, is the best form of ancillary treatment in my experience.

Physical training, games and rambles suit others better, but one must remember that a keenness for exercises is often a form of projection of symptoms in physical terms, the patient hoping that if he gets fit he will be well.

The value of these methods depends a great deal on the personality of the staff in charge. An indifferent worker cannot be replaced by the best medical officer.

Hurst (19) pointed out during the last war the importance of a nursing staff with an understanding and remedial attitude, and Maclay has recently further stressed this. One has sighed sometimes for a few nurses with an R.M.P.A. certificate. The further value of dances, cinema shows, concerts and whist drives is not forgotten.

Results of Treatment.

Results are affected by the speed with which treatment is instituted.

As Garmany (12) points out, a great deal depends on the basic personality, the ability to cope intellectually and the determination to persevere despite symptoms. Youth and resilience (5) are good signs.

Lewis and Slater (25) drew up a table of prognostic factors, four from the history and six after service. A score of four is more or less immaterial, but with six or over the outlook is poor. These bad factors may be partially offset by good points (25, 29), aggression, competitiveness, sense of discipline, independence, social adaptability, and so on. Rees (30) considers gastric and rheumatic histories of bad prognostic import, as are effort syndromes, causeless breakdowns, short term cyclothymias, over-scrupulous self drive without insight or humour, paranoid psychopathy and shiftlessness. Hyland and Richardson (20) recommended invaliding chronic cases, defectives with symptoms, psychopaths and near-psychotics, and retaining the moderately severe acute cases and malingerers and those who normally were stable.

The results of treatment are not easy to assess. Many of those returned to duty are by no means cured, and we may be sure that many who are invalided have been considerably relieved. One report from a mixed civil and military hospital stated that " most of the service cases have to be discharged as unfit," which is amazingly gloomy. The percentages returned to duty vary considerably, 28 per cent. (36), 44 per cent. (26), 54 per cent. (20), 75 per cent. (4), which sound very low compared with figures in the last war, when well over 80 per cent. went back to duty. My own figure for the hospital cases was 82 per cent. returned to duty, usually with a reduced category of medical fitness. Of the clinic cases, invaliding was at once recommended for 30 per cent. of psychopaths and obsessionals, 25 per cent. of hysterias and depressions, and 15 per cent. of anxiety states. 44 per cent. of women, mainly hysterias, were recommended for immediate invaliding.

What evidence is available indicates that about two-thirds of hospital patients returned to duty are still carrying on from 12 to 15 months afterwards. This is a considerable further loss, and indicates that invaliding should be more frequent, but it means also that something over 50 per cent. of admissions are reasonably fit a year after discharge from hospital. Curran (4) thought his relapse-rate was small, but Hyland and Richardson (20) found only 25 per cent. satisfactory. Considering individual reaction types, 90 per cent. of anxiety states admitted to hospital returned to duty, 80 per cent. of depressives, and 60 per cent. of hysterias, obsessionals and psychopaths.

One must not forget to think in long terms even at this stage. Gantt (11) pointed out that early neurotic symptoms often tended to spread with the passing of years, and illnesses evaluated now, or kept in control and not seen, may produce

severe developments in the future, particularly in the post-war years. It is conceivable that many excellent men who struggle with nervous disabilities from a high sense of duty may succumb to breakdowns in future years, and we should be prepared to advocate their proper care. Gantt reported good results from eighteen months' quiet farming. Such methods are useless at present for various reasons, but such reasons will not be operative after the war.

I have seen several men invalided some years before the war for anxiety states, who have returned and carried on successfully since hostilities commenced. This is a small fact, but recalls the truth that psychoneuroses may show dramatic changes for the better over long periods, and illustrates the need for long-term help.

Conclusions.

(1) The psychoneuroses, as seen in 450 Royal Air Force ground personnel, including 150 hospital cases, are briefly discussed.

(2) Refusal to try is not a main cause of failure to adapt to service life.

(3) The importance of predisposition is confirmed, but it is at present overstressed, and what can be done despite it is not yet fully known.

(4) Endogenous depression and obsessional neurosis are not only often mixed, but show the greatest frequencies of nervous heredity, psychotic colouring and history of previous breakdown.

(5) Reactive depression may shade into anxiety or hysteria, but endogenous depression, as an expression of a manic-depressive constitution does not.

(6) Excluding hysteria, the diagnosis of psychoneuroses is much more personal than uniform.

(7) This variability depends on the frequent mixture of syndromes and on the failure to separate constitution from reaction.

(8) The reduction in hysteria as compared with the last war is discussed.

(9) No particular "psychology" of stammer was observed.

(10) Effort syndrome and hypochondriasis should not stand as diagnoses of themselves.

(11) The value of peacetime wards in general hospitals equipped for simple psychotherapy, narcosis, E.C.T., etc., is stressed.

(12) Post-war psychoneuroses deriving from wartime stress are mentioned, and the necessity for long-term therapy for war and post-war cases foreshadowed.

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A PARANOID REACTION ASSOCIATED WITH OCULOGYRIC CRISES AND PARKINSONISM.

By WILLIAM H. GILLESPIE, M.D., M.R.C.P., Dipl. Psych.,
Psychiatrist, Mill Hill Emergency Hospital, N.W. 7.

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PARANOID delusional reactions have seldom been reported in chronic encephalitics, in contrast to the commonly occurring schizophrenia-like reactions. Apart from the cases described by Kwint (1), Ostmann (2), McCowan (3, 4), and a reference by Neustadt (5) to an undescribed case, there seem to be few, if any, references in the literature until a recent paper by Brody and Freed (6) describing a case where obsessive ideas became temporarily converted during oculogyric crises into a paranoid condition. The present case therefore seems worth putting on record, the more so in that the patient's unusual intelligence helped to throw some light on the relationship between oculogyric crises and post-encephalitic mental disorder, a subject which has been discussed by Stern (7), Jelliffe (8), and more recently by Wexberg (9) and by Brody and Freed (6).

Case Report.

J. A—, male, aged 39, was admitted on 20.iii.42 to a neurosis centre complaining of doubts whether he should go to the police in order to tell them that he was being poisoned by his father or brother.

The father is described as a curious type, who finds the subject of his son's illness distasteful; it seems to have been taboo in the home. According to J. A— his father was severe towards the children and kept a belt beside the mantelpiece, which was applied to him long after he was too old for it, and he remembers his siblings looking on and laughing.

He always liked his mother and considers that she was a good mother. She was apparently not neurotic, and it is only since his illness that he has felt that she had to suffer greatly at the hands of his father. She died rather suddenly in 1936 of "heart failure," after having suffered for some years from epidemic encephalitis, thought to have originated in 1924, and characterized by restless and repetitive activity, without oculogyric crises.

J. A— was the eldest of five siblings; the next in age was a brother, the rest sisters. He seems to have had no special friends among them. He was a healthy robust child and showed no neurotic traits apart from nail-biting. Although now a small man, he was the tallest in his class till he was fourteen. At the age of ten he had ringworm of the scalp, was treated by X-rays, and since then has been partially bald. He won a scholarship to a secondary school, but was taken away at sixteen by his father, whom he blames for this. He has always been good at games, and had plenty of friends. He worked a three years' apprenticeship to an analytical chemist, then entered the University and graduated honours B.Sc. at the age of twenty-three. After a year's training he entered the teaching profession and taught in two schools from 1927 until 1936, when he resigned owing to his present illness. He has done no work at all since then.

The information obtained from the father suggests that there was some aloofness in J. A—'s personality with a lack of intimate contacts. It seems likely that this was at least in part the result of the inhibited and inhibiting milieu in which he was brought up. Socially, he evidently expanded much more in the university atmosphere, where he mixed well and was often elected to positions of responsibility. He took an active part in society debates, was ambitious and had plenty of energy. He was not shy with either sex. His intelligence was of a high order, and he was among the best two or three students of his year.

He took a considerable pride in his appearance, and was particular about his clothes "matching." There were in fact distinct though mild obsessive traits in his personality. He kept a diary, even before his illness, and this gives a picture of a young man serious almost to the point of priggishness, attending church regularly and noting the text, taking a keen interest in his work, but also in golf and swimming. He denies that he was fussy and meticulous; but he used to avoid cracks in the pavement, occasionally counted his steps, or tried to walk from one lamp-post to another with his eyes shut to see if he could walk straight; he would say to himself, "If I don't do this, I'll not get through my exam.," and really felt he must do it, believing in the idea for the moment. He made a hobby of stamp-collecting. These traits have become greatly exaggerated since his illness, as we shall see. It was not possible to elicit any evidence of paranoidal traits; he does not appear even to have been unduly sensitive. It is clear that

he did not confide in his family; but it is doubtful if he can be held mainly responsible for this. He showed no hypochondriacal or hysterical traits.

His sexual life has always been inhibited. He first began to masturbate around the time of onset of his symptoms (1927 or 1928), at first daily, then about once a week, and this continued till about 1935, when he made a successful effort to stop it, but on one occasion went to the doctor because he was worried about his " absolute continence." He has never been engaged, though he has often thought of getting married, but since his illness he realizes that it is impossible. There has been mild heterosexual play of the " necking " type, in which he has always felt that he was being made a fool of by the woman, who was " taking advantage of his good nature." His meagre sexual experience bears an interesting relation to his symptoms, as will appear later, and he himself at times attributes them to " sexual frustration."

According to J. A—'s original account, the illness began with oculogyric crises in 1927 or 1928. There is no trace of an acute attack of encephalitis, but in 1926 he noticed " a bad taste " in his mouth, and developed the idea that he had got it from kissing a girl, and that it was due to syphilis ; he had his blood tested, and later he insisted on having all his teeth extracted. This symptom was probably the first manifestation of his encephalitis, and it shows in an interesting way the tendency (later to become so pronounced) to interpret his bodily complaints in the first place as being due to some kind of " poisoning " by someone else, and secondly as being of sexual origin. It should, however, be mentioned that although as the result of inquiries he made, J. A— convinced himself that this incident occurred in 1926, he stated at first that it was in 1935. The bad taste continued for years.

In 1927 or 1928 J. A— was teaching in a school in the country. He began to have attacks in which his eyes turned up and he was unable to control them ; the attacks occurred usually in the evening, not when he was teaching, and lasted several hours. They were not more frequent than once a week, and they were not accompanied by any distress or other phenomena, so that he did not take them very seriously. If an attack came on at a dance, for example, he would not necessarily feel bound to leave. However, he did on one occasion consult an eye specialist, who prescribed glasses for astigmatism.

In 1928 he had a mild concussion, which seems to be irrelevant and to have left no residual symptoms.

In 1929 or 1930, after moving to a school 20 miles from home, he began to suffer from disturbances of sleep, went to the doctor and received sleeping powders. The oculogyric crises affected him now during school hours at times, and he found things more difficult, but carried on his work without complaint.

In 1935 a new kind of attack appeared, described as " brain storms," in which a burning feeling started at the back of his neck and rose rapidly over his head ; he has often imagined it was blood running down. With the onset of the new symptom, he developed the idea that it was a sign that he was being poisoned by his landlady. He states that he really believed this from the beginning, and did not regard it as ridiculous. At first he went to a hotel to avoid poisoning, but later returned to his lodgings, where he accused his landlady, and once poured away a glass of milk ; yet he remained on perfectly friendly terms with her ! In this year he went to another eye specialist, who referred him to a neurologist, and here the true diagnosis was at last made.

J. A— carried on in this way under great strain until December, 1936. The ideas of poisoning occurred both with the " brain storms " and with the oculogyric crises. In November, 1936. his mother, who had been ill with encephalitis lethargica for years, died of a sudden heart attack ; he had seen her in her usual health a few days previously. Next month he resigned his post, as he felt so " terribly ill " with the " brain storms " and ideas of being poisoned. He was kept under observation in hospital for a fortnight in January, 1937, where he had no attacks until the day he was leaving. After this he began taking long walks by himself, and he gradually linked together the idea of poisoning with his mother's death, thus developing the theory that his father had poisoned his mother ; he did not, however, accuse his father then, feeling that he must collect more data. Later he became more and more convinced that his father was poisoning *him*, possibly with the medicine his mother had had for her sleepy sickness.

This idea crystallized into conviction on July 1, 1937, when his father gave him a dish of baked beans which were over-salted. It is doubtful when he first voiced his belief, and the father is vague on this point, but has been aware for at least a year or two that for about a day every two or three weeks J. A— suspected his father of trying to poison him. Although realizing in a way that this idea is due to illness, the father nevertheless resents being thus picked out, rather than any other member of the family ; but in fact the patient's suspicions presently extended to his brother, and latterly he found it hard to make up his mind on which of them he should place the blame. Two months later he started leaving home for long periods in order to get away ; he joined the Youth Hostels Association, and spent much of his time cycling or hiking, but he always returned home in the intervals.

In 1938 he went into a mental hospital as a voluntary patient for a month ; but even there he felt his father was poisoning him by sending him poisoned cakes or sweets, which he nevertheless felt he must eat. For the last four months before admission to the neurosis centre he had been staying in a hostel, spending his time walking or reading in public libraries ; he generally spent the afternoon in bed to ward off attacks.

Much light is thrown on his mental state during these last years by his diaries. In

July, 1937, he speaks of persecution in the lounge of a hotel by four men who were discussing him. A tendency appears to fast and give up smoking in the hope of combating the disease, which here again is clearly conceived of as being acquired orally. "Sweets affect the pupils of my eyes. Should cut out all white sugar products." A more general hypochondriacal tendency also shows itself.

The diary of 1938 is missing. That of 1939 is full of references to poisoning, particularly when he is at home, but also when in France and Germany, where he shows ideas of reference and fears the police are after him. He thinks remarks are passed about his physique, and occasionally that references are made to his femininity—"Une Anglaise." There are frequent references to his eyes, and he often plays on the word. His eyes make him "the most easily recognized person in the world." On 3.iii.39 he writes, "Great deal worse 12 p.m. Gandhi starts 'fast to death.' So would I if I was certain it *was* in my food, but I get very bad *through the night*, and what's more, it's largely psychological." 12.v.39: "Surely they're not *all* poisoners, everywhere. Yet, a man comes into the hostel Wednesday evening, presumably to look for a piano accordion. He says 'His father . . . poison . . .' The man's wife says 'He looks like it' and immediately the conversation switches to Hitler. Maybe it was about Hitler before she made that remark. But I'm sure that man was just another of my father's emissaries. Can anyone tell me how he has the power to persuade everyone to poison me?" 30.v.39: "Once there was only one poisoner. Now I haven't a friend anywhere."

In 1940 there is more expression of doubt about being poisoned, e.g. "It can't be psychological." "*Can't be poison*, must be *psychological*—but who is or *are* at the bottom of it?" "Not poison so much as poisonous people." This merely means that he regards his illness as due to psychological, not pharmacological persecution. He is continually deciding to go to Scotland Yard and lay the "facts" before them, but as constantly finding some reason to postpone his action. He expresses the agony through which he passes during attacks (not necessarily accompanied by ocular symptoms) in such terms as "THE ultimate limit of human suffering," and always regards his subsequent recovery as an inexplicable miracle. The diary for 1942 extends up to his admission here. It is the most abnormal, showing much paranoia, constant stress and emotional tension leading to incoherence. There are frequent references to being terribly ill, but having no eye trouble; which he generally takes to mean that his condition is due to poisoning, not encephalitis. 18.i.42: "No trace of 'eyes' so far, which just proves that J.'s 'eye' trouble is *manufactured*. . . . To-morrow morning I go to New Scotland Yard. Better than *murder* anyway! Not for *my* protection but for *theirs*."

In addition to the mental changes already described, there had been a pronounced increase of his formerly only slight obsessive traits. He took to collecting all kinds of useless things, such as tram tickets, and he became excessively orderly and meticulous. He would often have to get out of bed to make sure, for instance, where he had put a cigarette end, searching the whole house for it.

Present Mental State.

He is a very friendly and pleasant little man, and forms an excellent rapport, showing no signs of paranoid mistrust. This impression remains despite his aggressive outbursts and even during them, and he appears as an intact lovable, highly intelligent personality, having something extraneous wrong with it. This is confirmed by the Rorschach findings, reproduction of which is forbidden by considerations of space.

He is ready and eager to discuss his symptoms, and states that he has thoughts which "chase each other round and round" in his mind. They tend automatically to lead to his home and his father, in spite of his efforts to prevent it. The leading example of such thoughts is the idea that his father has poisoned him. When he is not having an attack he is prepared to believe that this is not in fact true; he nevertheless maintains that "it is true as a question of psychology, owing to the peculiar working of my mind." While his father may not literally have poisoned him, he has certainly done him a great deal of harm by his words and actions. The instances he gives to support this view are of a trivial kind. Even in the intervals he is convinced that his mother was poisoned.

When he is "feeling bad" he often feels impelled to go to the police to lay information against his father, but latterly the idea has been that they should protect his father against an attack by him. He once described in detail how he would murder his brother by causing a weight to fall on his head.

Although his obsessive thinking sometimes leads him to feel that his thoughts are being dictated from home, he shows in general no passivity ideas and no evidence of schizophrenic thought disorder. He denies auditory or other hallucinations, though there is some evidence that he misinterprets what he hears, believing that people are making derogatory remarks about him, more especially just before or during an attack (not necessarily oculogyric). Most commonly these supposed remarks refer to his eyes; but at times they refer to other features of his appearance about which he is sensitive, e.g. his baldness or his small stature.

On the affective side he shows marked emotional lability, more pronounced during attacks. He becomes miserable and introspective when he thinks of his home life and his future. He is irritable and over-sensitive; when another patient insisted on using a rake for weeding, he became so upset that he had to take to bed. His instability was shown also when he fell into a

state of hopeless love with the ward sister, with great jealousy of other patients to whom he thought she gave more attention. He denies having ever felt any suicidal inclination.

His sensorium is intact, and it did not need a maximal score on Progressive Matrices to show that he is of high intelligence, despite the absurdity of some of his ideas.

Physical Findings.

He is a small man, showing signs of mild parkinsonism, without other abnormality. Though the face is not actually mask-like, expressive movements are slow and somewhat deficient. Voluntary facial movement is asymmetric, being weaker on the right. The eyes move freely, but convergence is poor. There is possibly slight ptosis on the right side. The fundi are normal. Intonation is slightly flat, especially when reading aloud, and speech somewhat slow. There is cog-wheel rigidity of the left arm, which is not swung in walking; dysdiadochokinesis is not marked. There is a fine tremor of the fingers and of the legs; it resembles shivering more than ordinary extrapyramidal tremor. He tends to hold one hand in the other, evidently to hide the tremor. The gait is slightly festinant. There is no excessive salivation.

The Oculogyric Crises.

Several oculogyric crises were observed while he was in hospital. The eyes turn upwards, but he makes continuous efforts to bring them down, and succeeds momentarily in doing so; then they turn up again. This is accompanied by fluttering of the eyelids. The mental state during the attacks varies; generally they are preceded by heightened emotional sensitivity with marked ideas of reference, e.g. he thinks other patients are talking about him and calling attention to his eyes. During the attack there is a great increase of hostility, not only towards his father but also towards the environment in general, and on one occasion he complained bitterly about his hospital treatment. The affect is one of impotent rage combined with self-pity and a tendency to cry, his voice trembling with emotion. He says there is anxiety there too, meaning however a fear that someone might be talking about him or laughing at him; but there is no feeling of apprehension.

There was never any evidence of his state of consciousness being impaired during attacks, neither can it be said to be widened, as some authors have suggested (Bürger and Mayer-Gross, 10). He has some difficulty in concentrating on what is said to him, but is more conscious of himself and "more alive to certain thoughts, especially of poisoning." He does not feel that he is consciously directing his associations at these times—he is not "giving his thoughts a free rein, but they do gallop away on certain lines, usually ending up at home." Neither does he feel that these thoughts come against his will (in contrast to his obsessive thoughts when there is no attack). He denies any excessive consciousness of what he is doing, and there is no tendency to keep up any inner comment or registration of his doings (cf. Mayer-Gross and Steiner, 11).

Four minutes of strenuous hyperventilation failed to produce any abnormal effects.

The "Meaning" of the Symptoms.

Jelliffe (8) has insisted on the necessity of considering post-encephalitic symptoms from the point of view of the motives and strivings of the organism as a whole, regarding them not as the direct expression of a physical lesion, but as the total reaction to the situation produced by such a lesion. He applies this conception not merely to the mental symptoms, but also to such apparently physical ones as oculogyric crises and the parkinsonian attitude and muscular rigidity. Jelliffe has been followed in this direction by other authors, e.g. Wexberg (9) and Brody and Freed (6), the last two authors going further still by trying to dispense entirely with an encephalitic aetiology in their two cases.

J. A— was questioned carefully from this point of view. In the first place it must be noted that the oculogyric crises were present for seven or eight years before there were any accompanying mental symptoms (apart from the earlier bad taste in the mouth with the idea of syphilitic infection). He is very definite about the fact that during these years the crises were unaccompanied even by any special affect, and they interfered with his life very little. Neither are the crises at present accompanied by any attempt to ascribe a meaning or function to them. It is true that he feels people are talking about him or laughing at him, but he does *not* feel that the eyes are moving in an attempt to see them (as in Wexberg's case).

On the other hand, he provides plenty of material relative to supposed causation of the crises. On the negative side he is clearly concerned to reject the view that

they are due to encephalitis—he states openly that he does not believe it. In his worst moments he is convinced that the attacks are due to poisoning. At other times they are due to psychological persecution by his family. But behind all this he has a conviction of the *sexual* aetiology of his symptoms. In a general way he says they are due to "sexual frustration," for which he is inclined (probably rightly) to blame his family, though he admits that in practice it was a case of self-frustration. He contrasts bitterly the treatment his father has given him, the "good" child, with his favouritism towards a sister who behaved sexually in an unsatisfactory way. This theme is linked intimately in his mind with that of the good, suffering mother and the bad, persecuting father. A fact to be borne in mind, though he did not mention it in this connection, is that excessive masturbation began at the time of onset of the crises. No doubt this betokened the increased sexual urge or diminished inhibition which is common in this condition.

More specifically, however, he has a very interesting theory of the origin of his oculogyric spasms. He attributes them to an incident in 1926 or 1927 when, with her consent, he looked at a girl's breasts. He felt at the time that this was a wrong thing to do, that as a single man he had no right to such an experience. Later he developed a phantasy that the girl's mother was a witch and would punish him. The compulsion to look up might be regarded as a punishment that fits the crime, and not only an expiation but an undoing of it. He had not, however, looked down, but straight forward at the breasts. This theory was quite spontaneous, without an iatrogenic element that could be discovered. Chronologically it fits in quite well, as the incident occurred somewhere about a year before the onset of crises; but the theory becomes considerably less convincing when we learn that it did not occur to J. A— until several years after the crises began. This fact raises the strong suspicion that we are dealing here with a *rationalization*, not a piece of psychological aetiology. This is confirmed by the reflection that many of J. A—'s other symptoms may reasonably be seen in the same light. What he will not admit is that he is suffering from the effects of encephalitis, about which very little can be done. Instead, he maintains that his troubles come from without, either from his father's poisoning or persecution, or from sexual frustration. This tendency to project the knowledge of the inner disease is common in organic mental disorders, especially in the senile psychoses, where I have observed many cases in which the idea of death from natural causes is denied, and instead the patient develops paranoid ideas of injury and persecution.

We are dealing here with the synthesizing function of the ego, with its attempts to come to terms with an unacceptable piece of reality. The reality of the disease has to be distorted before it can be incorporated in that general picture of the self and the outer world which is acceptable to the patient's narcissistic wishes. At the beginning it was sufficient merely to ignore the oculogyric crises; it was possible to regard them as of little importance because they did, in fact, cause little inconvenience. Later, when they began to disturb him more by occurring during working hours, he probably attempted to control the situation by a reinforcement of obsessional personality traits. When another symptom (the "brain storms") became added to the crises, he began to bring projective mechanisms into play in developing the idea that he was being poisoned. Yet he continued working for another 20 months, and it was only when his mother died that he became finally unable to cope with life in a normal way. It is easy to see how the death of his mother, a sufferer from the same disease, would naturally affect him. Even more strenuous defensive measures clearly became necessary if he was to avoid the acknowledgment of the seriousness of his own condition. The poisoning idea became extended to embrace his mother, and the father became the chief villain, followed later by his younger brother. Simultaneously he began living at home again, and his life thereafter consisted either of living at home or strenuously repudiating life at home by repeatedly, as it were, running away and living more or less as a tramp. Naturally there were sound practical reasons for living at home, but we can scarcely fail to see here a regression to a childish state of affairs, and the familiar outlines of the Oedipus complex become obvious, with the good mother persecuted by the bad father, and the hostile rival siblings. Here again I do not doubt that his family's attitude contributed to the result, but it does not account for his steadily increasing tendency to attribute a hostile intent to events in the world around him. Clearly the projective mechanism is in play, but why does he

have so much hostility to project? Can this increased hostility be due to the frustration involved in his illness? Or must we postulate, with Jelliffe (12) and Stengel (13), a direct effect of the encephalitic process on instinct, increasing aggressivity, or promoting instinctual defusion?

My material does not suffice to answer this question, but the following remarks may be relevant. In J. A— the hostility and the paranoid reaction is a part-reaction, and does not involve by any means the whole personality; he is very far removed from the ordinary paranoid, or even obsessional personality. He is an exceptionally friendly, pleasant and lovable patient, despite his aggressive outbursts, and even during them; and I do not think this is just reaction-formation. There is little evidence, therefore, of a total increase of aggressivity, though clearly it gets out of hand at certain times; this might be consistent with the defusion theory. However, it is impossible in J. A—'s case to overlook the close connection between the paranoid ideas of a hostile world and the eye symptoms, on which he is continually harping and about which he is so sensitive. The paranoid ideas sometimes refer to other "inferior" features, such as his baldness, small stature or femininity. In this connection it is of interest to recall the patient's own theory that his disease is due to sexual frustration. All this suggests that we are dealing here with castration anxiety, stimulated by the encephalitic attack on his eyes.

Jelliffe argues that oculogyric spasm is not confined to encephalitics; but he can hardly deny that the exceptions are uncommon, and that it occurs in a remarkably large proportion of encephalitics. I cannot see how one can escape the conclusion that the symptom is due to some specific tendency of encephalitis to localize itself in the brain, rather than attempt to "explain" it psychologically, as Jelliffe does, by speaking of "I will lift up mine eyes unto the hills," etc. I am more inclined to attribute such phantasies, whether of the patient or the doctor, to an attempted rationalization of something essentially as irrational as a hemiplegia. I think J. A—'s case bears out this view. The oculogyric crises came first, the explanatory phantasies followed a long way after.

In so far as I was able to understand the psychopathology of this case I feel more inclined to see it in terms of the views expressed by Hoffer (14), the only author, so far as I am aware, who has published details of the psycho-analysis of a post-encephalitic patient. Hoffer regards the mental symptoms of his patient as a reaction of the ego against the internal perception of a change in the neuromuscular apparatus, which the ego experiences as a castration threat and elaborates in a manner determined by the individual historical development.

Summary.

The case is described of a highly intelligent man suffering from oculogyric crises followed by parkinsonism, accompanied by an obsessional and paranoid development.

The mental changes associated with the oculogyric crises are described, with a discussion of the bearing of these findings on the psychopathological views expressed by other authors.

I wish to express my thanks to Dr. W. S. Maclay, Medical Superintendent of Mill Hill Emergency Hospital, for the opportunity of studying this case.

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AN UNUSUAL BRAIN INJURY: WITH A NOTE ON LESIONS OF THE SUPERIOR CEREBELLAR PEDUNCLE.

By J. C. Sawle Thomas, M.R.C.P., D.P.M.

The case about to be described presented a problem of some complexity in neurological diagnosis. The attempt here made to unravel the problem is set forth with the full realization that some quite different explanation may be the true one. The true explanation, however, is incapable of proof and the view offered here is only suggestive, though of some interest because of the rarity of lesions of the superior cerebellar peduncle in man.

M. T. C—, aged 31, labourer; native of Eire. He had been working in this country for about three months and then lost his job owing to the work on which he was engaged having been completed. Following this he became extremely depressed and on 5.x.42 he picked up a 6-in. nail and, holding this pressed against his right temple, banged his head against a wall until the nail penetrated the bone; he then pushed it right into the brain with his hand.

He was immediately taken to a general hospital, where the nail was withdrawn. It was said to have penetrated a distance of 4 in., at right angles to the right temporal bone. On admission the patient was "drowsy and appeared to be confused. No positive neurological signs." Seven days later he began to show a rise of temperature; this reached 101° F. on the ninth day and then subsided. There has been no febrile disturbance since. His mental state caused some anxiety, and on the tenth day he was certified as insane and transferred to a mental hospital.

The certificate stated: " . . . is restless and sits up in bed with eyes shut and has to be put back on his pillows. Is extremely apathetic . . . calls out from time to time, slaps his body . . . . spits and is incontinent of urine and faeces."

On admission to the Mental Hospital on 15.x.42 he was extremely drowsy; lay with his eyes closed, breathing stertorously. He understood all that was said to him and knew why he was in hospital. He answered questions briefly but accurately and readily obeyed commands, e.g. to put out his tongue. There was marked emotional facility, euphoria alternating with weeping. He was only vaguely orientated as to time and place, but this was largely due to indifference, and apart from this he was not confused. There were no delusions or hallucinations. His habits were never faulty and he co-operated to the best of his ability.

Physical examination showed a small scar ½ in. in front of the anterior margin of the right ear and 1 in. above the zygomatic process. The sense of smell was unimpaired. Eye movements were normal; there was no nystagmus and no papilloedema or other abnormality of the fundi. There was pronounced weakness of all the lower facial muscles on the left side. The tongue showed a fine fibrillary tremor and deviated towards the left when protruded.

Speech was slurred, but this was complicated by the drowsiness and also by a very broad Irish brogue.

The whole of the right side, including face, trunk and limbs, was unaffected.

Marked loss of tone and power were present in the left arm, but the tendon reflexes were brisker than those of the opposite side. There was no muscular wasting. Co-ordination of movements was normal when allowance was made for the extreme weakness, and dysmetria was not observed. There were no abnormalities of sensation.

Abdominal reflexes were brisk on the right side, very weak on the left. Cremasteric reflex brisk on right, absent on left.

The left leg showed similar loss of tone and weakness to that of the arm and the tendon reflexes were also increased. Babinski's sign was negative on both sides. He was unable to stand unsupported.

Seven days later: drowsiness still intense; patient apathetic and quite indifferent to his surroundings, but could be made to laugh or cry with ease. When asked about his injury, he said that he felt tired of life because he had lost his job, and decided to commit suicide; he described in some detail how he drove the nail into his head and affirmed that he was conscious the whole time. He did not remember feeling any odd sensations or weakness on the opposite side of his body, but his memory for the events of the next few days was hazy.

Fourteen days after admission (24 days after injury) he was persistently cheerful and able to remain awake for longer periods.

Within a month strength and tone were returning rapidly to the left arm and leg; he was

able to walk about and do everything for himself. There was still an abnormal degree of drowsiness and he closed his eyes at every opportunity.

19.xii.42 (66 days after the injury): There was slight weakness of the left lower face; the tongue was protruded normally; hearing, smell and taste normal. Tone and power were only slightly reduced in the left arm and leg, but the increase in the tendon-jerks persisted. Abdominal reflexes were still weaker on the left side; the left cremasteric reflex had returned, but was weaker than the right. The gait showed a tendency to veer to the left, e.g. in walking round the ward garden he often found himself straying into the flower-bed at the side of the path, but Romberg's sign was negative and he never fell. Automatic movements were absent on the left side. Whenever possible he kept his left hand in his trouser pocket. Speech was still slurred, and there was increased salivation.

His mental state was facile; he laughed easily and rather fatuously and showed little real affect. He occupied himself to a limited extent, but was reluctant to use his left hand. It was remarked by several different observers that his expression and demeanour were strongly suggestive of a post-encephalitic state.

Three months later (April, 1943) his general condition was good. He had gained one and a half stones in weight. There was still a tendency to fall asleep easily, but he was able to occupy himself usefully throughout the day. Hypotonia had disappeared completely and the facial weakness could no longer be detected. There was slight loss of power in the left arm, and he had developed a coarse tremor of the whole arm when he held it outstretched. There was also a slight intention tremor. Abdominal reflexes were brisk and equal. Cremasteric reflexes present, but weaker on the left side. Left knee jerks slightly increased. Salivation was still somewhat excessive, and he still had a tendency to deviate to the left when walking. This was his condition when he was discharged on 25.v.43 and he returned to Eire.

Results of pathological investigations carried out were as follows:

Urine: Reaction acid. Sp. gr. 1018; no albumin; no sugar; no acetone; no abnormal deposit. The quantity of urine was never excessive.

Blood urea: 40 mgm. per 100 c.c.

White blood-cell count: 6,000 per c.mm. The differential count was within normal limits.

Blood Kahn: Negative.

Cerebrospinal fluid: Kahn, negative; clear, colourless; pressure not increased. Cells: 230 R.B.C., 3 lymphocytes per c.mm. Protein: 50 mgm. per 100 c.c. Globulin: no increase. Sugar: Normal. Lange gold curve: 0012110000.

The blood in the specimen was due to trauma at the time of puncture.

Sugar tolerance curve: Fasting, 98 mgm. per cent. After 50 gm. glucose: ½ hour, 180 mgm. per cent.; 1 hour, 150 mgm. per cent.; 1½ hours, 100 mgm. per cent.; 2 hours, 100 mgm. per cent.

Before considering in detail the physical findings in this case, it is of some interest to consider the mental aspect.

Family history.—Both parents alive and well. The patient is the eldest of six children, all the others being in good health. Before his birth, however, there were two stillbirths and one child which died at the age of two months.

No information could be obtained concerning his scholastic record, but for 15 years after leaving school he worked as a messenger boy and helped his father as a jobbing gardener. He is said to have been cheerful and friendly, with no tendency at all to moodiness or depression prior to his coming to England. He is a non-smoker and a teetotaller.

He was never submitted to a complete set of intelligence tests, but rough testing suggested that there was a considerable degree of mental defect and the intelligence quotient was roughly estimated at about 75. It seems probable that a certain amount of childishness and emotional instability were natural to him.

It is significant however that so soon after a serious suicidal attempt there should be so little real depression, and this is in accordance with the findings of Guttman (1943) in cases of suicidal head injuries. There is no reason for supposing in the present case that the actual cerebral damage, limited as it must have been to the temporal lobe and the posterior hypothalamus (*vide infra*), was responsible for the change in his mental state, and it seems, therefore, to provide a further argument in favour of Guttman's conclusion that recovery is due to the combined operation of physical and psychological factors. In this case the depression occurred in a man having a poorly developed personality who had never before been separated from the protection of his home and family, and who is suddenly confronted with loss of employment in a strange country. The head injury provided him with the protection which he lacked, and the realization that he would eventually be returned to his family without any major effort on his part.

In attempting to assess the damage to the brain by reference to the physical findings, one is at once struck by the fact that the neurological signs were essentially those of a cerebellar lesion, coupled with some hypothalamic disturbance.

Ignoring the latter for the time being, the evidence in favour of a cerebellar lesion consists of muscular hypotonia, with visible and palpable flaccidity of muscles; disturbance of posture, inability to stand without support and a tendency to fall towards the affected side. The absence of tremor can be explained by the complete loss of tone. There was no nystagmus or rotation of the head, but these signs are believed to be due to involvement of the vestibular tracts, which were evidently not affected in this case.

Several experiments have been made on cadavers in which a nail of similar size has been driven into the skull at the same point. The results have differed to some extent in each case according to the direction which the nail has taken after entering the cranium and to the configuration of the latter. In one case it traversed the basal cistern without causing any damage to blood vessels or cranial nerves, and ended in contact with the opposite crus cerebri. In another it pierced the walls of the third ventricle, and in yet another it was embedded in the midbrain, having traversed the inferior part of the internal capsule, and ended near the red nucleus. In all cases the tip of the temporal lobe was pierced and some part of the hypothalamus was affected.

The pons and cerebellum were not reached in any of the experiments.

It would appear, then, from these experiments that the cerebellar symptoms in the present case must have been due to a lesion of those fibres which emerge from the cerebellum by way of the superior cerebellar peduncle—the cerebello-rubro-thalamic tract—and it seems probable that the actual damage to the tract took place above the red nucleus, so that in effect it was the rubro-thalamic tract which was damaged. The reason for this statement will be given later.

It is well known that efferent impulses from the cerebellum travel from the dentate nucleus via the superior cerebellar peduncle to the red nucleus of the opposite side, decussating in the mesencephalon. Fulton (1938) states, however, that " the more important projection of the dentate nucleus in man, however, is that to the latero-ventral nucleus of the thalamus. The dentate nucleus thus contributes little direct influence to the rubro-spinal pathways . . . its primary connections are with the cerebral cortex."

The rubro-thalamic fibres must lie in fairly close relationship to the posterior hypothalamus. Ranson (1937) has shown that lesions of the posterior hypothalamus produce intense drowsiness, and at the same time he demonstrated that " lesions farther forward in the region of the optic chiasma or farther back in the red nucleus or higher up in the thalamus do not cause somnolence." Assuming that this would hold true for man as well as cats and monkeys, it can then be definitely stated that the lesion in this case involved the posterior hypothalamus. If, then, a line is drawn from this region to the tip of the temporal lobe, it will be seen that the rubro-thalamic tract is the only possible place in which cerebellar fibres could be involved.

Lesions of the superior cerebellar peduncle in man are rare, and I have not been able to find any record of a lesion of the rubro-thalamic tract. In Holmes's (1922) large series of cases of cerebellar injury only two had suffered damage to the superior cerebellar peduncle. In these two he found that the musculature on the homolateral side showed hypotonicity rather than atonicity. He also stated that the plantar reflexes are unaffected by lesions of the cerebellum and " the abdominal and cremasteric reflexes remain unchanged." In discussing the influence of cerebellar disease on muscular power, the same author refers to the reluctance on the part of the patient to move the affected limb, particularly the arm. Such a reluctance was a marked feature in the present case.

C. K. Russell (1931) describes a case of thrombosis of the superior cerebellar artery causing a lesion of the superior cerebellar peduncle and tractus spino-thalamicus. The cerebellar signs were similar to those in the case here described, but ataxia would seem to have been more marked.

The superior cerebellar peduncle was cut in the monkey by Earl Walker and E. H. Botterell (1937). They observed that hypotonia was not an outstanding sign in their series; but this sign has been observed in primates. These authors also remarked on the disinclination of the animal to use the limb and referred to an irregularity of the gait.

Ferraro and Barrera (1936) with similar experiments on monkeys found that " even in fairly large lesions the symptoms were usually fairly slight . . . only

a moderate degree of ipsilateral dysmetria or ataxia, hyporeflexia or hypotonia were present." They did not observe nystagmus or resting tremor.

These experimental lesions were all made caudal to the red nucleus and before decussation of the fibres had taken place and so are hardly comparable to the present case. But there is sufficient similarity in the leading features to emphasize that it was essentially the same tract which was damaged. In none of these recorded experiments was the loss of tone so extreme as in this case.

But there are additional signs which require explanation. The transient loss of the superficial reflexes with increase in the tendon jerks is interesting in view of the complete absence of any other indication of a pyramidal lesion. The most likely explanation seems to be that of an inflammatory reaction of mild degree round the track of the nail spreading upwards towards the internal capsule and corpus striatum. Had it been only oedema due to the trauma one would have expected the reflexes to have returned to normal much sooner than they did.

Facial weakness was very pronounced and is perhaps the most difficult sign to account for, although Russell Brain (1933) states that this is common as a neighbourhood symptom in lesions of the temporal lobe; according to Gordon Holmes (1922), it is rare to find any definitely abnormal asymmetry of the face in unilateral cerebellar lesions.

The development of a tremor of the left arm during the stage of recovery is interesting. It suggests that the original absence of tremor may have been due to the cutting off of impulses from the corpus striatum to the red nucleus. As these fibres gradually recovered their function, the control which they normally exert would be disordered and tend to give rise to tremor. Russell Brain has suggested that the hypotonia of choreo-athetoid syndromes may be ascribed to a deficiency of the normal contribution of the striatum to postural tone. It may be, then, that the disorganization of striatal function in the present case was responsible for the extreme degree of hypotonia by reinforcement of the loss of tone produced by the lesion of the cerebello-rubro-thalamic tract. On the other hand, it seems more likely that choreo-athetoid movements are due to the striatal lesion, while the hypotonia results from damage to the cerebello-rubro-thalamic tract itself.

There is always some hesitancy in reporting a single case, but this presents such unusual features that it is felt that there is justification in offering it for consideration.

Summary.

A case of attempted suicide is described in which the patient drove a 6-in. nail into his skull. The resulting neurological disturbance is analysed and a possible explanation of the physical signs is given.

The rapid recovery from the depression is confirmatory of the findings of Guttman in other cases of suicidal head injuries.

An attempt is made to demonstrate that damage was caused to the cerebello-rubro-thalamic tract, giving rise to severe loss of tone on the opposite side of the body with absence of other signs usually associated with cerebellar damage.

The literature concerning lesions of the superior cerebellar peduncle is briefly reviewed.

It is suggested that the hypotonia of choreo-athetoid states is due to damage to the cerebello-rubro-thalamic tract.

I have to thank Dr. C. A. Keane, Medical Superintendent of the Northampton County Mental Hospital, for permission to publish this case.

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EYE MOVEMENTS IN ELECTRICAL SHOCK PROCEDURE.

By F. F. KINO, M.D.,

West Riding Mental Hospital, Wadsley, Sheffield.

Two previous publications have been devoted to the behaviour of various reflex phenomena, and of the grasping phenomenon in particular, during the post-convulsive stage of the electrically produced seizures in man (1942, 1943).

This paper deals with eye movements in the shock procedure, and experiments planned to influence these movements.

The motor response of the electrically produced seizure can be subdivided into four phases: the paroxysm, the tonic cramp, the clonic convulsions and the post-convulsive stage.

The equal, symmetrical and synchronous stimulation of both frontal lobes in the shock procedure gives rise as a rule to a bilaterally equal response during each of the four stages. Occasional irregularities do occur, but they are minute and, what is more, do not show any constancy in their individual appearance.

From this general rule the eyeballs form a remarkable exception.

During the very short paroxysm the eyelids are forcibly screwed up and accurate observation of the position of the eyeballs is not possible. In the tonic stage the head is bent backwards, the eyelids widely opened and the eyeballs moved upwards to a maximal conjugate end-position. This triad of motor reaction is a regular synkinetic group in which the opisthotonos is the last to relax, whilst the eyeballs are the first to change their position.

In the clonic phase the eyelids immediately participate in or even initiate the general convulsions; the head, too, makes powerful back or sideways jerky movements, but no clonic twitchings of the eyeballs can be discovered.

At the end of, or even during, the clonic stage the eyeballs commence from their upwards position a slow, smooth and extensive rotation, which ends at first as a conjugate latero-superior posture, but after several seconds changes into a strictly lateral one.

Thus it happens that the eyeballs continue a tonic type of movements at a time in which all other voluntary muscles are still involved in convulsive twitchings.

After an individually variable interval the eyes return slowly to their normal central posture or, more rarely, cross this position, moving to the opposite canthus, and after a while return definitely to their point of departure.

Occasionally some individual variations of these eye-rotations can be observed. The eyes may turn straight upwards or still rarer straight downwards and the regular lateral conjugate deviation is missing.

Another remarkable feature of these eye movements is their constancy in a given individual. Under the same experimental conditions each person exhibits the same motor eye phenomenon, peculiar to this individual not only with respect to the whole motor pattern but even to the duration of a given deviation. The lateral deviation is rarely under 20 seconds in duration, in many cases it is very forceful and as long as two minutes or so, but on the average it lasts for about one minute.

The following examples illustrate the individual motor patterns:

E. B—, aged 46.	19.viii.43:	Deviation to left for	70	sec..
	22.viii.43:	,, ,,	75	,,
	24.viii.43:	,, ,,	65	,,
L. C—, aged 33.	15.vii.43:	Deviation to right for	90	sec.
	17.vii.43:	,, ,,	80	,,
	20.vii.43:	,, ,,	90	,,
	27.vii.43:	,, ,,	120	,,
	8.viii.43:	,, ,,	80	,,

E. M. R—, aged 44. 20.vii.43 : Deviation to right for 85 sec.
then to left for 20 ,,
22.vii.43 : Deviation to right for 80 ,,
then to left for 25 ,,

As long as the eyes are directed upwards or latero-superiorly the eyelids are kept widely open; they are semi-closed and finally closed during the further stages of the eye rotations.

The head shows as a rule a faint lateral inclination homonymous to the deviation of the eyes. In some persons the turning of the head is more marked, although, on the other hand, many keep their head straight forward or may even turn it in a contralateral direction.

Statistical control of several hundred cases has evidenced that the number of persons who deviate their eyes to right or to left is almost equal.

Right-handedness has no bearing whatever on the direction of the primary deviation. Moreover, observations made with left-handed persons have shown almost the same distribution of the direction of deviation as observed in right-handed individuals.

The same can be said with regard to other possible factors as sex, age or character of the mental disorder.

An attempt was made to influence this constant individual pattern of eye-movements, especially the direction of the primary lateral deviation, by a simple experiment.

A person who in several sessions has shown an invariable deviation to one particular side has been instructed to keep her eyes actively and steadily fixed for 2–3 minutes on a given homolateral point just before a new shock application. In many cases, under the influence of this purposive movement, a reversal of the individual direction could be brought about; in others the eyes did not deviate at all; and finally in a large group the preparatory fixation did not influence the individual pattern in the least.

Three instances illustrate these three degrees of influence:

D. H—, aged 32. In four consecutive sessions eyes deviate to left. Eyes actively fixed for one minute to left. Deviation in opposite direction, to right.

M. M—, aged 48. In four consecutive sessions eyes deviate to left for about 30 sec. Actively fixed to left for two minutes before a new shock. Eyes do not deviate at all.

M. B—, aged 30. During six consecutive sessions eyes deviate to left for about 40 sec. Before a new shock eyes are actively fixed to left for two minutes. Deviation nevertheless to the left for 40 sec.

Discussion.

The character of the conjugate eye deviation as observed in our cases and its association with the movement of the head is almost identical with the results obtained in direct experimental electrical stimulation of a definite part of the frontal cortex in monkey and man.

Leyton and Sherrington (1917) found that from a frontal area embracing a considerable part of the surface of the second and third frontal gyri conjugate deviation to the side away from the stimulus could be obtained. When the lateral conjugate deviation has been obtained, it has been usual for the eyes to remain for some time in the posture thus assumed, and to return very slowly towards the primary straightforward posture after the stimulus has been withdrawn.

Similar effects have been found in man. Boldrey and Penfield (1937) obtained adversive movements of the eyes alone as a large group of responses in an area which centres roughly in area 8.

It is obvious that the conjugate eye deviation of our patients, which has quite the same features as those observed by direct stimulation of one frontal adversive eye-field in monkey and man, has been brought about by stimulation of the same frontal eye area.

What makes these observations more complicated and at variance with the usual physiological behaviour is the fact that equal and simultaneous bilateral stimulation has produced the same effect as the stimulation of one side only.

On account of the individual constancy of the direction and even of its duration any casual factor directing the eyes to one or the other side can be definitely dismissed. The response is a regular neurophysiological act.

The mechanism leading to a lateral conjugate deviation under the conditions of our observations must consequently be based on a difference in the degree or duration of a sustained excitation in both adversive eye-fields.

The physiological difference between the right and left hemisphere, particularly in their motor activities, could, *a priori*, suggest that an equal stimulus may be able to produce in the two opposite eye areas a different degree of response. But the motor dominance of the left hemisphere in the large majority of our right-handed cases has proved to have no bearing whatever on the direction of deviation, and the same has been true with regard to the small group of left-handed individuals.

The difference in response of the two adversive eye-fields in a given individual to a simultaneous electric stimulation represents therefore a particular and specific property of the adversive eye-field. This personal quality varies in degree from one person to another. On the grounds of the results obtained by the experimental part of our investigations three degrees of this property could easily be distinguished.

In the case of a person whose habitual deviation in the post-convulsive phase is to the left, the right adversive eye-field is obviously in a state of stronger and/or longer excitation than the left. Now we keep this person looking steadily to left for 2–3 minutes just before a new shock has been given. With this purposive deviation of the eyes we are putting an active strain on his right adversive eye-field. In many cases his eyes turn now to the right instead of to the habitual left side. Obviously the active fixation of the eyes to left for 2–3 minutes brought about a state of relative inhibition in the right adversive field, and the following bilateral electrical stimulation originated in the left unstrained area a stronger and probably longer response than in the right one.

In some cases such total inversion of the habitual direction of the deviation could not be obtained, but the tendency to deviation was at least paralysed and the eyes remained unmoved. Eventually in others the individual inclination was so powerful that the preparatory fixation was not able to influence it at all.

From both the observation of the eye movements in the post-convulsive phase and the results of experimental investigations, the fact seems to be established that each person is endowed with a dominant adversive eye-field responding stronger or longer to an equal electrical stimulation.

Summary.

In spite of a symmetrical, equal and simultaneous stimulation of the frontal lobes in the electrical shock procedure, the eyes perform as a rule during the post-convulsive stage a forceful lateral conjugate deviation.

The direction and the duration of this deviation is a constant feature, characteristic of a given individual.

By an active turning of the eyes to the homonymous side for 2–3 minutes immediately before the shock this individual direction of the deviation can in many cases be paralysed or even reversed into opposite direction.

Right-handedness, sex, age or character of the mental disorder have no bearing whatever on this individual pattern of eye deviation.

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PAROTID GLAND SECRETION IN AFFECTIVE MENTAL DISORDERS.

By H. J. EYSENCK, Ph.D.,* AND P.-M. YAP, B.A.,
Psychological Laboratory, Mill Hill Emergency Hospital.

INTRODUCTION.

Parotid gland secretion is one of the most easily observable manifestations of autonomic activity, and a study of the secretion of this gland should be helpful both in the elaboration of the theory of autonomic activities and perhaps also in practical diagnosis (1, 2, 3). Strongin and Hinsie have shown that whereas normal subjects secrete on the average ·07 c.c. per 5-minute period, varying from ·02 c.c. to ·15 c.c., none of a number of manic-depressive patients studied by them secreted more than ·01 c.c. per 5-minute period (4, 5).

Although age, general food and water intake, smoking habits, etc., were not controlled, thus making the two populations not strictly comparable, these results strongly suggest that in affective disorders there is a tendency towards a less copious flow of saliva under the conditions of the experiment. The experiment to be described was designed to test this hypothesis with respect to neurotic (depressed and anxious) and psychotic patients.

Another problem which was investigated simultaneously was that of the effect of mental effort on parotid secretion. Brunacci and de Sanctis were the first to show that mental effort had an inhibitive effect on salivary secretion (6); Lashley, however, found that mental work had rather a stimulating effect (7, 8). Winsor reports results supporting Brunacci and de Sanctis (9). It appeared desirable to investigate this problem, not only because of its intrinsic interest, but primarily because it appeared possible that patients suffering from affective disorders might show not only a difference from the control group in the absolute amount of saliva secreted, but also in their reaction to mental stimuli.

THE EXPERIMENT.

Measurement of the secretion of the parotid gland was carried out in the following way: The subject was seated in a chair, reassured about the purpose of the experiment, and encouraged to assume a comfortable position. Copious secretion to facilitate the fixing in the right position of a small disc similar to that developed by Lashley (7, 8) was ensured by dropping some lemon essence on the tongue of the patient; the disc was then firmly held over the opening of Stenson's duct by suction produced by inhaling on a tube leading from the outer chamber of the disc. From the inner chamber of the disc a small rubber drainage-tube passed through the corner of the mouth of the subject, carrying the secretion to the actual measuring device, which was modified from Richter and Wada's description (10). In this device the saliva is drained off through a long, thin, horizontal glass tube, calibrated in mm., and the actual progress of the saliva is indicated by means of an air bubble, introduced through a T-connection.

The neurotic patients taking part in the experiment, all of whom were tested at Mill Hill Emergency Hospital, were divided into two groups. As the experimental group we took patients diagnosed as anxiety and/or depression cases; as the control group we took patients of varied diagnosis not showing pronounced affective symptoms, i.e. hysterics, some effort syndrome cases, etc. The respective numbers in these categories are given in Table I. Also given in that Table are the numbers of the psychotic affective and psychotic control groups, all of whom were tested at St. Francis' Hospital. The control subjects were mainly paranoid schizophrenes; the experimental group consisted of patients with endogenous depressions and melancholias, showing, however, in many cases definite reactive features. The psychotic and neurotic groups are discussed separately in later sections.

* With the support of the Rockefeller Foundation.

TABLE I.

Classification.	Male.	Female.	Total.
Neurotic controls	12	12	24
Anxiety cases	13	13	26
Depression cases	13	13	26
Psychotic controls	8	5	13
Psychotic affective disorders	4	7	11
Total	50	50	100

Three separate experiments were carried out. In the first experiment the patient was allowed to settle down and to get over the effect of the lemon essence on his tongue. Then readings were started, and the amount of secretion in c.c. determined for the following periods: (1) Three minutes' silent reading; (2) three minutes' rest; (3) three minutes' mental arithmetic, the patient writing down the results; (4) three minutes' rest; (5) three minutes' food imagery, aided by the showing of coloured pictures of food, taken from American magazine advertisements; (6) three minutes' reading; (7) two minutes' work on the Triple Tester*; (8) thirty seconds' rest; (9) two minutes' work on the Triple Tester; (10) three minutes' reading; (11) three minutes' rest. Pauses during which no readings were taken were introduced after periods (5), (6), (8) and (9) in order to let the possible after-effects of the preceding period's work wear off. These pauses lasted for only about 30 seconds. In this experiment all the 76 neurotic patients took part.

In the second experiment 24 neurotic patients took part, men and women being taken at random in equal proportions from each of the neurotic groups given in Table I. This experiment began, like the first one, with (1) a three minutes' reading and (2) a three minutes' rest period, followed by (3) three minutes' mental work, and (4) three minutes' rest. (5) Next the subject with closed eyes had a bottle of banana essence held under his nose for 30 seconds, followed after (6) thirty seconds' rest by (7) a bottle of pineapple essence, and, after (8) another 30 seconds' rest, by (9) a bottle of vanilla essence. (10) 30 seconds' rest and (11) three minutes' reading concluded the experiment. The three smells were strong and easily recognizable; pineapple was the strongest, vanilla the weakest.

The third experiment was carried out on the 24 psychotic patients, and followed exactly the same course as the second experiment, except that the "food imagery" test was interpolated after the second "rest" period.

RESULTS.

The total salivary output during the eleven periods of the first experiment was determined for each subject, and the results are plotted separately for the control and the affective groups in Fig. 1. The two affective diagnoses from Table I were taken together as one group because the average secretion of the patients in these groups did not differ to any significant extent. It will be seen, however, that the affective group as a whole differs considerably from the control group; while the average amount of secretion of the affective group was only ·58 c.c., that of the control group was ·82 c.c. This difference is statistically significant. It will be seen from the figure that 55 per cent. of the affective group secreted less than ·40 c.c., while only 35 per cent. of the control group secreted less than ·40 c.c.

The question naturally arises whether this difference exists in each one of the eleven experimental periods, or whether it becomes apparent in only a few of them. Fig. 2 shows that the amount of secretion of the two groups runs a closely parallel course, with the affective group consistently secreting less than the control group. This figure gives the average output of each group for 3-minute periods; periods of less than three minutes have been multiplied by a suitable constant to make them comparable. (Thus secretion during the "Triple Tester" period was multiplied by 3/2, etc.)

* The Triple Tester, designed and produced at Cambridge University, is a modified form of the Pursuit Rotor. The subject is required to manipulate a wheel which governs a stylus travelling on a drum bearing a number of dots; the number of dots touched by the stylus during a two minutes' run is recorded automatically, and constitutes the subject's score. There are two ways of operating the machine: direct transmission, which was used in (7), and indirect transmission, which was used in (9).

Fig. 3 shows the average secretion of the whole group (controls + affectives) during the (averaged) periods of rest, of reading, etc. In other words, for the purpose of this figure the various periods of rest have been combined into one

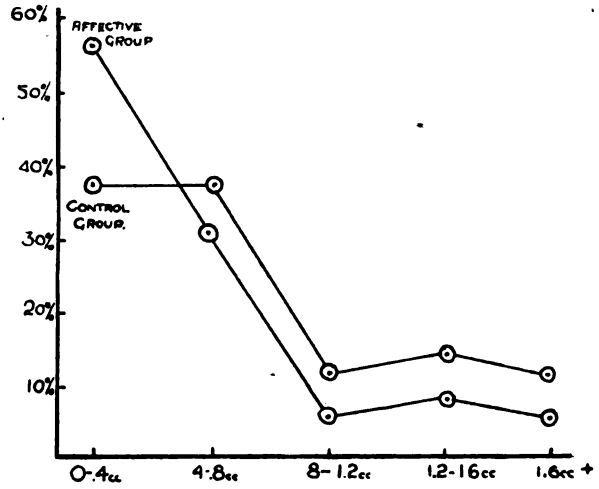

FIG. 1.—Total parotid gland secretion during experimental period of affective and control neurotic groups.

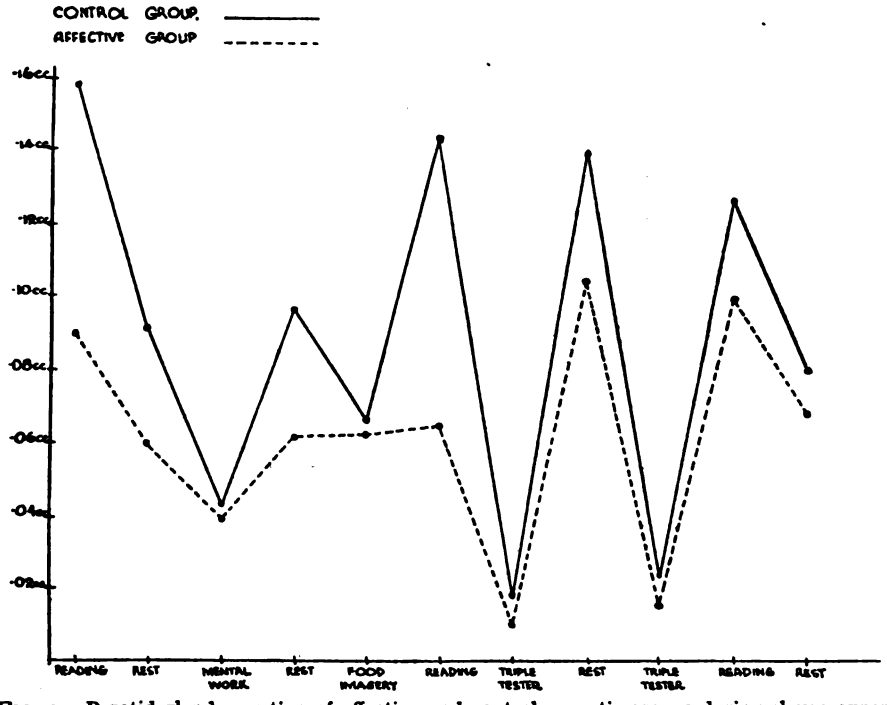

FIG. 2.—Parotid gland secretion of affective and control neurotic groups during eleven experimental periods.

score, as have the various periods of reading, etc. The figure brings out clearly that maximum secretion took place during the reading periods (·10 c.c.), and least during the "Triple Tester" periods (·01 c.c.).

Fig. 4 shows the scores of 24 neurotic subjects on the tests making up the second experiment. Again periods shorter than three minutes have been corrected to three-minute periods, in order to make the results comparable. As these 24 subjects had also taken part in the first experiment, we can derive a measure of reliability from their respective scores in the two experiments. Using total

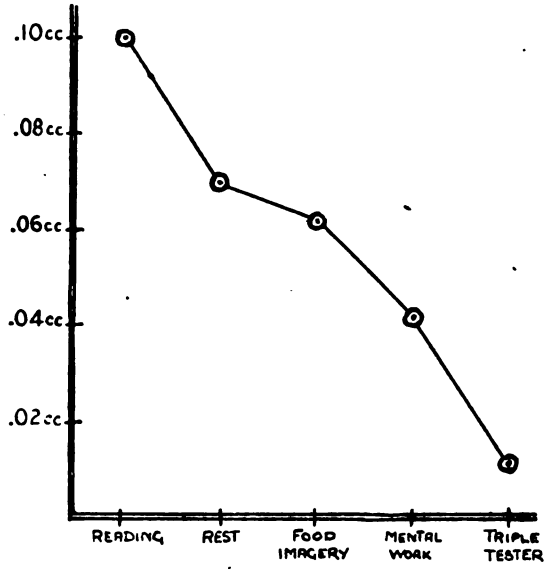

FIG. 3.—Average parotid gland secretion of total neurotic group during periods of reading, rest, etc.

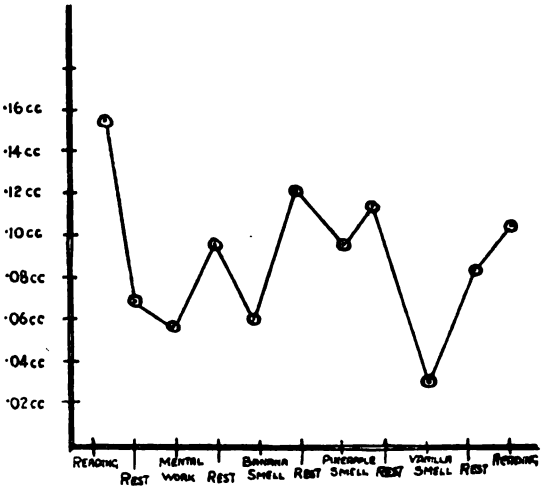

FIG. 4.—Parotid gland secretion of 24 neurotics during olfactory and other stimulation.

amount of secretion in each case, we find that the scores on the two experiments correlate to the extent of ·54 ± ·15 S.E. This correlation probably underestimates the true reliability, because different sub-tests were used in the two experiments to make up the total score. The subjects were tested at the same time of day for both experiments.

Fig. 5 shows the secretion of the affective and control psychotic groups on the 14 tests making up Experiment 3. It will be seen that apart from a slight overlap

of the two curves at one point, they run a comparatively parallel course, the affective curve being consistently below the control curve. The total amount of saliva secreted during the period of the test was 1·31 c.c. on the average for the control group, and ·96 c.c. on the average for the affective group. This difference is statistically significant.*

It is interesting to note that the ratio, $\frac{\text{secretion of controls}}{\text{secretion of affectives}}$, is almost identical for the neurotics and the psychotics; for the neurotics it is 1·41, for the psychotics 1·36. Where so many variables could not be controlled, such as different food in different hospitals, different lengths of stay, different attitudes to doctors, etc., this coincidence should not be considered as anything more than a pointer for future research; it seems of sufficient interest, however, to be mentioned in passing.

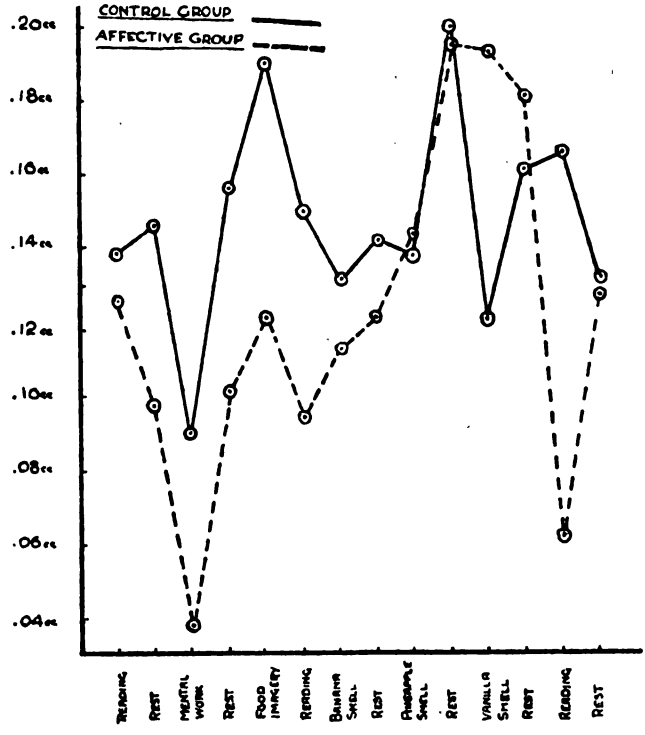

FIG. 5.—Parotid gland secretion of affective and control psychotic groups during 14 experimental periods.

When the scores of the two sexes were plotted separately, it was found that on the average the women secreted slightly less than the men, in the proportion of 1·0 to 1·2. This difference is about as large as the difference in body size between the sexes, and suggests that secretion is partly determined by general size. As long as we do not know the correlation between body size and amount of salivary secretion, this cannot be more than a suggestion; it remains possible that quite independently of body size women tend to secrete slightly less saliva than men. It is interesting to note that Wenger observed the same phenomenon in his measurement of the secretion of young children; there also girls secreted less than boys in about the same proportion as did our patients (11, 12). In this case, of course, body size cannot be responsible, young girls not being any smaller than boys.

* It will be noticed that the psychotic groups tend to secrete more saliva than the neurotic groups. This may possibly be due to the fact that the psychotics were, on the average, 25 years older than the neurotics. No reliable figures are available regarding the influence of age on salivation, but observation suggests a positive correlation.

Discussion.

The fairly definite nature of the results reported in the previous sections hides several problems to which we cannot give an answer. The fact that under the conditions of the experiment patients with affective disorders secrete less saliva than do the patients in the control groups does not prove, for instance, that in general patients with affective disorders secrete less saliva than other neurotics and psychotics. The discrepancy between the groups may be due wholly to their different reactions to the experimental situation. It is well known clinically that emotional experiences may have an inhibiting effect on salivary secretion, and to the affective patients the experimental situation may have a much more emotional meaning than to the controls (12*a*).

Again, it must remain doubtful if the secretion as measured by means of the Lashley technique actually measures normal salivary secretion, or whether it only measures the salivary secretion produced by the parotid gland under the artificial conditions of sensory stimulation induced by the Lashley disc. The arguments usually brought forward against this interpretation do not seem quite conclusive. No doubt it is true that early experimenters (13, 14, 15), who observed subjects with fistulas and found no parotid secretion when the subject was resting, erred, as Krasnogorski has pointed out, in considering that secretion from such fistulas was a reliable index of parotid activity (16); yet it is doubtful if secretion during stimulation by the Lashley disc is an altogether reliable index either.

Two reasons often given for assuming that secretion is not due to sensory stimulation are (1) that the flow of saliva decreases considerably when the subject lies down to rest, and (2) that additional mechanical stimulation in the mouth does not increase salivary flow. Against these arguments it may be urged that it is well known that there is a considerable reduction of salivary flow during sleep (17), and the semi-hypnagogic state of the resting subject might possibly account for a lessening of the effects of awareness of stimulation through the disc. As regards additional mechanical stimulation, it is only necessary to call to mind the Weber-Fechner Law to see that the experiment leaves the matter indeterminate.

Perhaps a more convincing argument could be based on the fact that in Fig. 2 there is no evidence of any decline in the amount of salivation from the first six minutes of reading and rest to the last six minutes of reading and rest, almost 30 minutes later. If the original salivation had been caused to any significant extent by awareness of mechanical stimulation, one might suppose that adaptation would have reduced the flow during the period of the experiment.

Yet while this argument may be allowed a certain cogency, it should not be forgotten that there are great individual differences in the reactions of subjects to the experiment, and that averages tend to gloss over these differences, and may be definitely misleading. The safest conclusion to be drawn from the evidence at the present moment would seem to be that the amount of salivary secretion during an experiment of the type here described may be due to three factors: (1) The natural rate of salivation of the subject; (2) awareness of the mechanical stimulation of the wall of the mouth through the Lashley disc; (3) the emotional reaction of the subject to the experiment. It is quite likely, furthermore, that these three factors assume different inportance for different subjects, and at different times for the same subject. The fact that the retest correlation is not very high supports this view.

Provided we recognize the limitations of the experimental procedure, and take care not to over-interpret our data, we may note some definite conclusions. Thus under the conditions of the experiment there is a significant difference between patients with affective disorders, both neurotic and psychotic, and patients with hysterical, schizophrenic and other non-affective disorders. Whether this difference was due to a generally less copious flow of saliva in the affective group in ordinary circumstances, or to their more emotional reaction to the experimental situation, we were not able to determine. The fact that both the affective and the control groups showed similar reactions to a variety of stimuli, such as reading, mental work, the Triple Tester, etc., might perhaps be adduced in support of the first view, but cannot be regarded as definitely proving the correctness of this view.

As regards the effect of mental work on our subjects, the results definitely support Brunacci and de Sanctis (6). Secretion is about ten times as copious during silent

reading as during the continuous and strenuous mental exertion involved in working the Triple Tester. Secretion during rest is about twice as copious as during mental work (arithmetic). While we may thus regard the fact as established that under the experimental conditions mental effort decreases parotid secretion, the explanation of the fact is by no means simple.

On the view that we are measuring normal parotid flow, our data would be interpreted as showing a direct diminution of flow consequent upon mental activity; on the view that we are measuring parotid flow produced largely by awareness of mechanical stimulation, we would say that mental work directs attention away from the foreign body in the mouth, thus decreasing its stimulating effects. In favour of the first view is the fact that during reading there is a significantly more copious flow than during rest; it is difficult to account for this fact in terms of attention paid to a foreign body in the mouth. There are, however, difficulties in accounting for this fact in terms of the first view too; reading, after all, is mental work also, and should therefore produce a reduction in salivary flow from the resting state. Possibly the relation between salivation and mental stimulation is curvilinear; both low mental activity (sleep) and high mental activity (mental work) produce a reduction in salivary secretion; silent reading is mid-way between the two extremes, and shows maximum secretion. Rest is some way towards the " sleep " side of our continuum, and therefore shows a reduction in secretion as compared with reading. While this view is in accord with such experimental data as are in our possession, it cannot be regarded as anything but a theory which remains to be proved.

A curious fact which demands some explanation is the position of " Food Imagery " in Experiment 1, and of the olfactory stimuli in Experiments 2 and 3. Food imagery produced only ·06 c.c., as compared with ·07 c.c. secreted during rest; similarly, as shown in Fig. 4, and less clearly in Fig. 5, olfactory stimulation produced less salivary flow than did the intervening rest periods. This is so much at variance with our everyday experience that an explanation is required.

Two explanations are suggested by the experimental data. In the first place there are great individual differences between subjects in their reactions to olfactory stimuli; thus Winsor found in the case of one subject that " whenever olfaction alone was used . . . there was no evidence of a conditioned response " (17, p. 363). The actual data given by him show that the response during olfaction was less than during the rest periods. Thus in some individuals olfaction does not produce the usual phenomena of increased salivation. This fact is well in accordance with results obtained by M. Davies Eysenck (18), who found great individual differences in the attitudes of her subjects to olfactory stimuli, and in their sensory discrimination of them.

The second explanation is that, in Winsor's words, " when the stimulus was prolonged without reinforcing the unconditioned response, the flow soon fell to the level of the non-stimulated period. In the human subject this unconditioning process would seem to proceed much more rapidly than was the case with Pavlov's dogs " (17, p. 363). We also found that, after an initial spurt of salivation, when the olfactory stimulus was produced, salivation returned to a normal or subnormal level. The fact that this level was often subnormal may be accounted for by the fact that a certain amount of cognitive effort is involved in olfaction continued over a period of time.

It should be noted that the strongest smell (pineapple) produced ·09 c.c. of salivation, as compared with ·05 c.c. (banana) and ·03 c.c. (vanilla), the weakest. (The average secretion during the rest periods following upon these three periods of olfaction was ·10.) This suggests that the more pungent the smell, the greater the amount of salivation. It would be interesting to compare a large number of olfactory stimuli with regard to the salivary secretion associated with them, and perhaps to correlate the resulting order with the order of preference for the same smells (*cf.* (18) for a discussion of preference rankings for smells).

A point which is perhaps worth mentioning relates to Fig. 1. This figure shows clearly that the distribution of " amount of salivation " under the experimental conditions is not normal, but J-shaped. While it would of course be possible to change the shape of the distribution into a very much skewed normal curve by dividing the base-line into smaller units, yet the distribution would still be decidedly abnormal. We cannot suggest any explanation for this type of distribution, which is not usually found with biological data of this kind.

Summary and Conclusions.

The salivary secretion of altogether 100 neurotic and psychotic patients was measured in c.c. by means of the Lashley disc, under a variety of different conditions, such as olfactory stimulation, rest, reading, mental work, etc. Under these experimental conditions the following results were found:

(1) Salivary secretion in neurotic patients suffering from affective disorders (anxiety, depression) is significantly less than secretion in neurotic patients suffering from hysterical and other non-affective disorders. The control neurotic group secreted 1·41 times as much saliva as the affective group.

(2) Salivary secretion in psychotic patients suffering from affective disorders (melancholia, manic-depressive psychosis) is significantly less than secretion in psychotics suffering from schizophrenia and other non-affective disorders. The control psychotic group secreted 1·36 times as much saliva as the affective group.

(3) Men secreted 1·2 times as much saliva as women, a proportion similar to that which the body-size of one sex bears to that of the other.

(4) Salivary secretion is decreased during concentrated mental work. There is about ten times as much secretion during silent reading as there is during the most concentrated mental work.

(5) Food imagery and olfactory stimulation produce a reduction rather than an increase in the amount of salivary flow when the measurements are taken over a long enough period to allow " unconditioning " to take place.

(6) The curve of distribution of the " scores " (i.e. of the total amount of saliva secreted by each patient during the period of the experiment) is not normal, but resembles a J-curve.

(7) The reliability of the test, as measured by retesting a sample of patients after three weeks, is not very high, the correlations between test and re-test being ·54 ± ·15 S.E.

We are indebted to the Medical Superintendents of Mill Hill Emergency Hospital and St. Francis' Hospital for permission to test patients in their respective hospitals.

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VITAMINS B_1 AND C IN EFFORT SYNDROME.

By PHYLLIS G. CROFT, B.A., MAXWELL S. JONES, M.B., Ch.B., D.P.M., and DEREK RICHTER, Ph.D.

From the Central Pathological Laboratory (L.C.C.) and Mill Hill Emergency Hospital, London, N.W. 7.

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"EFFORT syndrome" is a comprehensive term applied conveniently to a group of conditions not apparently due to organic disease, characterized primarily by effort intolerance and manifesting breathlessness, palpitation, left chest pain and a subjective feeling of fatigue on even mild exertion. Vegetative lability on emotional excitement, e.g. palpitation, sweating, giddiness, etc., are described by the patient and may be objectively observed. We have found the simplest and most convenient classification of E.S. patients to be into (*a*) primarily constitutional, and (*b*) primarily neurotic groups. In the former (Group 1) the patient has had a poor physical endowment since earliest recollection, to which he has responded in a neurotic manner. In this sense there is a psychological aetiology, but the constitutional factor is the basic one. In the primarily neurotic group (Group 2) there is a definite psychopathology and the usual factors determining a neurosis apply: constitutional physical inferiority, if present, colours the whole picture, but is of only secondary importance. The whole problem has been studied in some detail in the E.S. Unit at this hospital, where more than 2,000 cases have been treated since the end of 1939 (Guttmann and Jones, 1940; Wood, 1941; Lewis, 1941; Jones and Lewis, 1941; Jones and Scarisbrick, 1941, 1942 and 1943).

In considering the factors that may give rise to effort intolerance the question arose whether certain types of effort syndrome might be attributable to malnutrition. Fatigue is prominent among the symptoms of dietary deficiency, and it has been associated in particular with deficiencies of vitamins B_1 and C. Point was given to this suggestion by the studies of Jolliffe, Goodhart, Gennis and Cline (1939), who observed the effects of mild vitamin B_1 deprivation on normal volunteers, and found "the symptoms observed were fatigue and lassitude, anorexia, precordial pain, burning of the feet, dyspnoea on exertion, muscle cramps and palpitation." The picture has much in common with that observed in effort syndrome, and emphasizes the unspecific character of this condition. Apart from a deficiency in the diet, a deficiency due to failure in absorption had also to be considered.

In the present investigation a series of patients in the Effort Syndrome Unit at the Mill Hill Emergency Hospital were examined by means of vitamin excretion and saturation tests with regard to their vitamin B_1 and C nutrition.

METHODS.

Vitamin B_1.—Vitamin B_1 estimations in urine were done by the improved thiochrome method of Harris and Wang (1941), using an Osira ultraviolet lamp and Chance glass filter. The vitamin B_1 saturation test was similar to that described by McAlpine and Hills (1941), and consisted in measuring the vitamin B_1 excreted in the period of 4½ hours immediately following the oral ingestion of 1 mgrm. vitamin B_1.

Vitamin C.—The resting level of vitamin C excretion was estimated on 3-hour samples by the "true ascorbic acid" method of Richter and Croft (1943). The saturation tests were done by the method of Harris (1942), which consists in estimating the daily excretion of vitamin C in a 3-hour sample after the oral ingestion

of 700 mgm./70 kgm. ascorbic acid. The blood vitamin C estimates were done by the lead precipitation method of Richter and Croft (1944).

Results.

Vitamin B_1.—Of a series of 21 effort syndrome patients who were selected for investigation, 11 were chosen as typical of the "constitutional type" and 10 had anxiety neuroses. The vitamin B_1 excretion ranged from 58 to 289 µgm./24 hours with a mean of 142 µgm., and showed no significant difference between the two groups (Table I). Subjects showing clinical signs of vitamin B_1 deficiency generally show a much lower excretion than this, of the order of 30 µgm./24 hour or less. The vitamin B_1 saturation test also gave a mean excretion of 115 µgm. or 11·5 per cent. of the test dose in the 4½ hour period after administration. These figures are well above the level commonly found in deficiency disease, and they gave evidence that in neither of the groups were the symptoms attributable to vitamin B_1 deficiency.

Table I.—*Vitamin B_1 Excretion and Saturation Test.*

Group 1.—Constitutional Type.

No.	Vitamin B_1 excretion (µgm./24 hr.).	Vitamin B_1 saturation (µgm./4½ hr.).
1	163	139
2	245	164
3	142	84
4	149	159
5	131	39
6	154	77
7	225	106
8	126	171
9	76	115
10	58	69
11	289	126
Mean	160	114

Group 2.—Neurotic Type.

12	116	135
13	83	59
14	117	73
15	81	87
16	130	81
17	155	115
18	154	152
19	89	175
20	224	171
21	76	117
Mean	122	116
Mean of both groups	142	115

The vitamin B_1 saturation is expressed as the urinary excretion in 4½ hrs. after a test dose of 1 mgm. vitamin B_1 (1 µgm.=1γ).

This finding was confirmed by testing the effect of vitamin B_1 administration. A group of 6 patients with effort syndrome who were given 15 mgm./day vitamin B_1 by mouth for one week gave no evidence of any subjective or objective improvement.

Vitamin C.—Estimation of the blood vitamin C concentration in 17 patients with effort syndrome gave figures ranging from 0·20 to 0·37 mgm./100 ml. with a

mean of 0·30 (Table II). These figures indicated a relatively low level of vitamin C nutrition, and this was confirmed by the urinary excretion and saturation tests. The mean resting level of vitamin C excretion was 14 mgm./24 hours, and of 12 patients who were given the saturation test only 2 were saturated in less than 7 days. These figures were obtained in the month of April, 1943, in the fourth year of the war. Administration of 100 mgm. vitamin C per diem for a period of 4 weeks (2·8 gm. ascorbic acid) was sufficient to raise (*a*) the mean blood level to 0·52 mgm./100 ml., and (*b*) the degree of saturation to a mean of 2 days in a small group of 6 patients. Out of 18 patients who were saturated with vitamin C, 2 stated that they felt better, but in none of them was the effort syndrome removed by this treatment.

TABLE II.—*Vitamin C Excretion and Blood Levels.*

Group 1.—*Constitutional Type.*

No.	Blood vit. C (mgm./100 ml.).	Urinary vit. C excretion (mgm./day). Day 1.	Urinary vit. C excretion (mgm./day). Day 2.	Days to reach saturation.
1	0·29	18	11	—
2	0·24	8	7	—
3	0·20	11	13	—
4	0·28	14	9	—
5	0·28	31	22	—
6	0·37	28	31	>6
7	0·32	5	8	>6
8	0·30	10	11	>6
9	0·28	8	10	5
10	0·34	18	5	3
Mean	0·29	16	13	—

Group 2.—*Neurotic Type.*

11	0·27	16	18	>6
12	0·36	15	15	>6
13	0·35	—	24	>6
14	0·30	7	10	>6
15	0·27	12	7	>6
16	0·34	5	8	>6
17	0·32	14	17	>6
Mean	0·31	11	14	>6
Mean of both groups	0·30	14	13	—

The urinary excretion figures were calculated from 3-hour samples.

DISCUSSION.

Recent work on Wernicke's syndrome has emphasized the relationship between vitamin deficiency and symptoms, such as lassitude, fatigue, dyspnoea on exertion and the cardio-vascular symptoms, which are prominent in effort syndrome.

In the present investigation the vitamin B_1 and C nutrition was assessed by several different methods in a group of army patients with effort syndrome. Standards vary a good deal as to what should be regarded as an optimal, adequate or deficient level of vitamin nutrition, and figures are given by certain American authors which are higher than those commonly obtaining in this country. In considering the vitamin C level it should be remembered that this shows a considerable seasonal variation, being lowest in spring, when the present investigation was carried out. This is due to the scarcity of green vegetables at this time of year

and the disappearance of vitamin C from potatoes, which are one of the main sources of vitamin C in the war-time diet. The vitamin C nutrition of these patients was low by most standards, but it was not lower than we have found in other groups of patients and in normal subjects at the same time of year. A group of 30 senile male patients at the Tooting Bec Hospital gave a mean blood level of 0·30 mgm./100 ml., and a group of 348 factory workers a mean level of 0·25 mgm./100 ml. during the spring of 1943. Macbeth (1943) has pointed out that there has been a progressive falling off in the vitamin C nutrition in this country since the war, and his figures for 1943 for other types of patients agree with our own. It is therefore unlikely that the symptoms of the patients with effort syndrome could be attributed to vitamin C deficiency.

The onset of lassitude and fatigue in vitamin B_1 deficiency is observed at excretion levels of the order of 30 mgm./day or less (Williams, Mason and Smith, 1939; Williams and Mason, 1941), and the mean level of 142 μgm. found by us is similar to the figures of 146 μgm., 198 μgm. and 93 μgm./24 hours found for normal individuals by other investigators (Melnick, Field and Robinson, 1939; Najjar and Holt, 1940). These figures therefore give clear evidence that vitamin B_1 deficiency was not a significant factor in producing the fatigue and other symptoms observed in the patients with effort syndrome at the Mill Hill Emergency Hospital.

The authors thank Dr. L. J. Harris and Dr. Y. L. Wang for advising them about the experimental details of the vitamin B_1 estimation, Dr. W. S. Maclay for his interest, and the Rockefeller Foundation for supporting this research.

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Part III.—Bibliography and Epitome.*

AN attempt is being made to provide as far as possible a complete bibliography compiled from the specialist journals dealing with Psychiatry and Neurology (which are really inseparable) and their ancillary subjects, psychology, anatomy of the nervous system, criminology, etc.

A number of titles may appear to have a very remote relation to psychiatry, but they are included for the sake of completeness.

If any reader can add the names of journals to the following list, which it is hoped to publish each year in the January number, the addition will be gratefully received and acknowledged.

Those journals which are available in the Library of the Royal Medico-Psychological Association are marked "1," those available in the Library of the Royal Society of Medicine are marked "2," those in the Library of the British Psychological Society are marked "3," and those in the Library of the British Medical Association are marked "4."

The titles of these journals are mostly in the form given by the Board of Editors of Publications of the American Psychological Association, January, 1939. Contributors are requested to use the exact form given below.

PSYCHIATRIC JOURNALS.

Abh. Neur. Psychiat.
Abh. Psychother.
Acta Española Neur. y Psiquiat.
2, 4 *Acta Psychiat. et Neurol.*
3 *Acta Psychol., Hague.*
Acta Psychol., Keijo.
Aliéniste Français.
2 *Allg. Ztschr. f. Psychiat.*
Altersprobleme.
Am. Imago.
Am. J. ment. Def.
2, 3 *Am. J. Orthopsychiat.*
1, 2, 3, 4 *Am. J. Psychiat.*
2, 3 *Am. J. Psychol.*
An. Bras. Hig. Ment.
An. Istit. Psicol., Univ. B. Aires.
An. Psicotec., Rosario.
Anal. Inst. Neurol., Montevideo.
Analele Psihol. (Rumania).
Anales de psicologia, Buenos A.
2, 3 *Année Psychol.*
2 *Ann. Méd. Psychol.*
2 *Ann. Osp. psichiatri., Perugia.*
Arb. Psychiat. Inst., Sendai.
Arch. Anthrop. crim.
2 *Arch. Argent. de Neurol.*
Arch. Argent. Psicol. norm. pat.
2 *Arch. Bras. de Neur. e Psiquiat.*
Arch. Brasil Hig. Ment.
Arch. Chilenos de Crim.
Arch. Ital. di Studi Neuropsich.
1, 2 *Arch. Neurobiol.*
4 *Arch. Neurol., Paris.*
Arch. de Neurol. de Bucarest.
1 *Arch. de Neurol.*
2 *Arch. di Antropol. Crim.*
Arch. di Crim. Neuropsiquiat. Disc. y Con., Quito.

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

2, 4 *Arch. f. Psychiat.*
2, 3 *Arch. ges. Psychol.*
Arch. Internationale de Neurol.
Arch. Ital. Psicol.
Arch. Krim. Anthrop.
1, 2, 3, 4 *Arch. Neurol. Psychiat.*
Arch. Neur. Psychiat., Mex.
2, 3 *Arch. Psicol. Neurol. Psichiat. e Psicoter.*
2, 3 *Arch. Psychol., Genève.*
3 *Arch. Psychol., N.Y.*
Arch. Relig. psychol.
Arch. Speech.
Arq. da Assist. a Psicop. de Pernambuco.
Arq. de Neuro-psiquiat. Brasil.
3 *Austr. J. Psychol. Phil.*

Beih. Z. angew. Psychol.
Beih. Zbl. Psychother.
Bol. Inst. Psiquiatria, Rosario.
2, 4 *Brain.*
3 *Brit. J. Educ. Psychol.*
2, 4 *Brit. J. Inebriety.*
2, 3, 4 *Brit. J. Med. Psychol.*
2, 3, 4 *Brit. J. Psychol.*
3, 4 *Brit. J. Psychol. Monogr. Suppl.*
Bull. Canad. Psychol. Ass.
2, 4 *Bull de la Soc. de Psychiatrie de Bucarest.*
2 *Bull. de la Soc. Roumaine Neur. Psychiat. Psychol. Endocrin.*
Bull. du Groupement Français d'études de neuro-psychopathologie infantile.
2 *Bull. Los Angeles Neur. Soc.*
Bull. Menninger Clin.
Bull. Soc. Psihol. med. Sibiu.

4 *Canad. Journ. Occup. Ther.*
3 *Cath. Univ. of Amer. Studies in Psychol. and Psychiat.*
2 *Cervello.*
2, 3, 4 *Character and Per.*
2 *Child Develpm.*
Child Develpm. Abstr.
Child Develpm. Monogr.
Child Study.
Chin. J. Psychol.
3 *Comp. Psychol. Monogr.*
2 *Confinia Neurol.*
Contr. del Lab. di Psichologia.
Contr. psychol. Theor.

2 *Deutsche Ztschr. f. Nervenh.*
Dis. Nerv. Syst.

Educ. psychol. Measmt.
1, 2, 3, 4 *L'Encéphale.*
2 *Epilepsia.*
Evolut. Psychiat.

Fiziol. Th. S.S.S.R.
2 *Folia Neuropath. Esthon.*
2 *Folia Psychiat. et Neurol. Japonica.*
2 *Fortsch. Neur. Psychiat.*

3 *Genet. Psychol. Monogr.*
Giornale di Psich. e di Neuropat.

4 *Hum. Factor.*
2, 3, 4 *Hyg. Ment.*

Illinois Psychiat. J.
Index Neurol. y Psiquiat, Buenos Aires.
3 *Indian J. Psychol.*
Industr. Psychol.
Industr. Psychotech.

1, 2, 3, 4 *Int. J. Psychoanal.*
2, 3 *Int. Z. Psychoanal. u. Imago.*

Jap. J. appl. Psychol.
Jap. J. Exp. Psychol.
Jap. J. Psychol.
1, 2, 3 *J. Abnorm. Soc. Psychol.*
J. Am. Soc. Psychic Res.
3 *J. App. Psychol.*
2, 4 *J. Belge Neur. Psychiat.*
2 *J. Comp. Neur.*
1, 3 *J. Comp. Psychol.*
J. Consult. Psychol.
J. Crim. Law and Criminol.
J. Crim. Psychopathol.
J. de Psychiatrie Infantile.
3 *J. Educ. Psychol.*
J. Except. Child.
3, 4 *J. Exp. Psychol.*
2 *J. f. Psychol. u. Neurol.*
3 *J. Gen. Psychol.*
J. Genet. Psychol.
J. Juvenile Res.
1, 2, 3, 4 *J. Ment. Sci.*
1, 2, 3 *J. Nerv. Ment. Dis.*
1, 2, 3, 4 *J. Neurol. Psychiat.*
J. Neuropath. and Psychiat., Leningrad.
J. Neuropath. Ex. Path.
2, 4 *J. Neurophysiol.*
J. Neuropsychiatrique du Pacifique.
J. Parapsychol.
J. of Psychical Research.
J. Psihoteh.
2 *J. Psycho-Asthenics.*
3 *J. Psychol.*
J. Psychol., Moscou.
J. Psychol. Neurol., Leipzig.
2 *J. Psychol. Norm. Path.*
J. Soc. for Psychical Research.
3 *J. Soc. Psychol.*
J. Speech Disorders.

Kriminalistik.
3 *Kwart. Psychol.*

Mag. psychol., Szle.
Ment. Health.
Ment. Health Obs.
2, 4 *Ment. Hyg., Lond.*
Ment. Hyg., N.Y.
Ment. Hyg. Rev.
Ment. Hyg. Bull., Indiana.
3 *Mind.*
Mschr. Krim. Biol.
2 *Mschr. Psychiat. Neurol.*

Ned. Tijdschr. Psychol.
2 *Neopsichiatrica.*
2 *Nervenarzt.*
3 *Neue psychol. Stud.*
Neurbiol., Pernambuco.
Nevrasse.
Nevropath. i. Psikhiat.
Note e Riv. di Psichiat.
Nowiny Psychjaryczne.
Nuova Riv. di Clin. ed Assistenza Psichiatrica.

Obshch. Klin. Nevropat.
3 *Occup. Psychol.*
2 *Occup. Ther. and Rehabil.*

2 *Onderzoekingen Psychiat-Neur. Klin., Utrecht.*
2 *Ospedale Psichiatrico.*

Person. J.
Pisani.
Polsk. Arch. Psychol.
Prace Psychol.
Proc. Amer. Assoc. Stud. Ment. Def.
Proc. A. Research Nerv. and Ment. Dis.
Psicholec.
Psicoterapia (*Cordoba*).
Psyche.
Psychiat. Monogr.
2 *Psychiat. en Neurol. Bl., Utrecht.*
2 *Psychiat. et Neurol. Japonica.*
2 *Psychiat. Neurol. Wchnschr.*
Psychiatry.
1, 2, 4 *Psychiat. Quart.*
2, 3 *Psychoanal. Quart.*
1, 2, 3 *Psychoanal. Rev.*
2, 3 *Psychol. Abstr.*
3 *Psychol. Bull.*
Psychol. Clin.
Psychol. Exch.
3 *Psychol. Forsch.*
Psychol. Index.
Psychol. Monogr.
Psychol. Rec.
3, 4 *Psychol. Rev.*
3 *Psychol. Rev. Monographs.*
Psychol. Stud., Univ. Bp.
Psychol. wychow.
3 *Psychometrika.*
Psychometr. Monogr.
Psychosom. Med.
Psychosom. Med. Monogr.

Quart. J. Speech.
Quart. J. Stud. Alcohol.

Rass. Neurol. Veget.
Rass. Studi Psichiat.
Rev. Argent. Neurol. Psiquiat.
Rev. de Psicoanalisis, Argentine.
Rev. di Neur. e Psychiat., S. Paolo.
Rev. di Psiquiatria, Chile.
Rev. di Psiquiatria y Crim.
3 *Rev. Franç. Psychoanal.*
Rev. Ibero-Amer. de Anal. Biblio. de Neurol. y Psiquiat.
Rev. Mex. Neurol. Psiquiat.
1, 2, 4 *Rev. Neurol.*
Rev. Neurol. di Buenos-Aires.
Rev. Neurol. Psychiat., Praha.
Rev. Neuro-psiquiatr., Lima.
Rev. Oto-Neur.-Oftal. Cir. Neur. Sud-Am.
Rev. Neuropsiquiatr.
Rev. Psicol. Pädag.
Rev. Psihol.
Rev. Psiquiat. Crim., B. Aires.
Rev. Psiquiat., Uruguay.
Rev. Psiquiat. y Disc. Con., Chile.
Rev. Sudam. Psicol. Pedag.
Rev. Tchèque de Neurol. et de Psychiat.
Ricerca Psichica.
2, 3, 4 *Riv. di Neurol.*
Riv. di Neuro-psiquiatria, Peru.
3 *Riv. di Psichologia.*
Riv. Ital. di Endocrin. e Neurochir.
2 *Riv. Patol. nerv. ment.*
Riv. Psichol. Norm. Pat.
2, 4 *Riv. Sper. Freniat.*

1 *Rocznik Psychjatryczny.*
Rorschach Res. Exch.

1 *Schizofrenie.*
2 *Schweiz. Arch. Neurol. Psychiat.*
Skand. Arch. Psychol.
Sovet. nevropatol., psichiatri, psichoguoguia.
Sovet. Psichoneurol.
Sovet. Psikhotekh.
Speech Monogr.

Tohoku Psychol. Folia.
Tr. Am. Neurol. A.
Tr. Beritov. Inst., Tiflis.
Tr. Kostchenko Ment. Hosp., Moscow.
Trud. fiziol. Lab. Pavlova.
Trud. tsentral. psikhonevrol. Inst.

Univ. Calif. Publ. Psychol.
Univ. Iowa Stud. Psychol.
Untersuch. Psychol. Phil.

3 *Z. angew. Psychol.*
Z. Arb. Psychologie.
Z. Berufsbildung des Pflegepersonals.
Z. Individ. Psychologie.
2, 4 *Z. ges. Neurol. Psychiat.*
3 *Z. Pädag. Psychol.*
Z. Parapsychol.
Z. Psych. Hyg.
Z. Psychoanalyse (*Tokyo*).
3 *Z. psychoanal. pädag.*
2, 3 *Z. Psychol.*
Z. Psychother. med. Psychol.
Z. Tierspsychol.
2 *Zbl. Neurochir.*
1, 2 *Zbl. ges. Neurol. Psychiat.*
Zbl. Psychotherap.

AM. J. ORTHOPSYCHIAT.

VOL. XIII. APRIL, 1943.

JULY.

OCTOBER.

AM. J. PATH.

VOL. XIX. MAY, 1943.

Histochemical Studies on Tissue Enzymes. III: A Study of the Distribution of Acid Phosphatases with Special Reference to the Nervous System.

1. The histochemical technic of Gomori for demonstrating acid phosphatases in tissues was modified to insure optimal enzyme activity. A variety of substances including enzyme poisons were used to establish the properties of these enzymes in tissue sections.

2. Using this improved technic the distribution of acid phosphatases in normal and neoplastic tissues is described. Acid phosphatase activity was found in nuclei as well as in the cytoplasm of many cells. The nervous system was found to contain large amounts of an acid phosphatase, as did both the male and female genital systems, parts of the digestive, hematopoietic, urinary, and endocrine systems.

3. A series of tumors of the nervous system was studied, and the acid phosphatase content of the tumors correlated with the enzyme content of the cell types from which the tumors were derived.

4. The significance of the histochemical technic in relation to function of the enzyme in individual cells is considered. (Authors' abstr.)

SEPTEMBER.

Effect of Vitamin E Therapy on the Central Nervous System in Amyotrophic Lateral Sclerosis.

Ten cases of amyotrophic lateral sclerosis were treated with vitamin E and alpha-tocopherol and, except for one, none responded clinically to this form of treatment.

Histopathologically, however, in six of the intensively treated cases the destruction of the myelin sheaths and axis cylinders was found to be much less intense than in the untreated cases. The dense gliosis which is usually present in amyotrophic lateral sclerosis was diminished or almost absent in those that received vitamin E. The lessened myelin sheath and axis cylinder destruction and the faint gliosis in these instances were perivascular and insular in distribution. On one of these the lessened changes were limited to one side of the cord only. The nerve cells of the involved bulbar nuclei and anterior horns remained unchanged and showed no signs of reversibility. The ultimate cause of death was bulbar in nature.

The histopathologic processes in the other four less intensively treated cases, although less extensive, were considered to be about the same as those found in untreated cases.

There is a possibility that vitamin E therapy resulted in a reversal of the reaction of degeneration affecting simultaneously and nearly equally the damaged myelin sheaths, axis cylinders and glia in amyotrophic lateral sclerosis. (Author's abstr.)

NOVEMBER.

AM. J. PSYCHIAT.

VOL. XCIX. MARCH, 1943.

The Effect of Electrically and Chemically Induced Convulsions on Conditioned Reflexes.

Experiments are reported in which a conditioned response to the sound of a bell was established in 18 male rats. This response was then inhibited by lack of re-enforcement with the unconditioned stimulus. Although control experiments showed that conditioned responses thus inhibited do not recover spontaneously, it was found that the application of one or more metrazol convulsions or of electrically induced convulsions restored temporarily the inhibited conditioned response. The experimentally proved removal of inhibition by "shock treatment" is of interest in view of the effects of the shock treatment in psychoses. (Authors' abstr.)

Electric Shock Treatment in General Paresis.

Electric shock therapy proved to be a perilous procedure in patients diagnosed psychosis with syphilitic meningo-encephalitis.

Alarming cardiovascular and respiratory failure accompanying a major reaction or even a minimum reaction necessitated discontinuance of this kind of therapy before any clinical improvement was noticeable. Therefore no evaluation regarding therapeutic benefit can be ventured. Two factors are discussed that may be responsible for the severe complications. (Authors' abstr.)

On the Use of Strychnine in the Curare-aided Metrazol Treatment of Psychoses.

A modification of the metrazol treatment is described. The material consisted of 30 female patients, who received strychnine simultaneously with curare intramuscularly in amounts of $\frac{1}{120}$ gr. to $\frac{1}{80}$ gr. preceding the injection of the metrazol.

Strychnine reduces the metrazol requirement, the maximum average dosage being only 23·5 per cent. higher than the initial average dosage, compared to 62·7 per cent. increase without its use. It is assumed that strychnine sensitizes the central nervous system to metrazol. It has a beneficial action on the respiration which is impaired centrally, due to the effect of the metrazol convulsion, and which is impaired peripherally due to the effect of curare. This action is assumed to be due to the excitatory effect of strychnine upon the respiratory center and to the action of strychnine on the peripheral nerves. It is concluded that strychnine might be of value by virtue of its sensitizing effect in metrazol as well as in other shock therapies. (Author's abstr.)

Amnesia, Real and Feigned.

Three main groups of causes or types of amnesia are: First, pathological, which may follow certain induced conditions, such as head injury, fever, hyperglycemia, drugs and alcohol, or may be inherent, such as the amnesia associated with various types of epileptic seizure. Second are psychological amnesias, usually diagnosed as psychoneurosis or hysterias. Third is feigned amnesia.

The distinctive features and the legal complications of these various types of amnesia are

discussed. The EEG seems to provide evidence which in many cases may assist in distinguishing pathological amnesia from the other forms. In those cases in which an illegal act is the result of a period of amnesia, which in turn is accompanied by a disorder of the electrical waves of the brain, treatment by means of medicine instead of by incarceration seems reasonable. Intensive research on this point is urgently needed. (Author's abstr.)

MAY.

A Follow-up Study of One Hundred and Eleven Non-hospitalized Depressed Patients after Fourteen Years.

1. A fourteen-year follow-up on 111 non-hospitalized depressive patients brought information from 84, 25 of whom are dead, 7 from suicide.

2. The suicide-rate in this group is many times that of the general population of the same age and sex.

3. There appeared to be more deaths from pneumonia among this group and perhaps fewer deaths from heart failure than are to be found in the general population.

4. At least four patients formerly given a diagnosis of depression are now regarded as schizophrenic; six patients have been in public institutions much of the fourteen-year period covered by this study.

5. Neurotic and hypochondriacal symptoms in combination with depression tend to accentuate the chronicity of the reaction.

6. Patients who recovered tended to have simpler disorders and some assets not usually found in those patients who were unimproved or worse.

7. None of these patients reported the use of shock therapy; this study may therefore serve as a basis of comparison with shock-treated patients.

8. Forty of 59 patients known to be alive are working in some degree.

9. Depression is a pathological state that deserves study as well as other damaging agents, such as neoplasms and infections, to the end of cure or prevention. (Authors' abstr.)

Prognostic Factors in the Involutional Psychoses.

1. During the period January, 1930, to January, 1940, 68 cases of involutional psychoses were admitted to the Norwich State Hospital, representing 0·8 per cent. of the total admissions. 17 died within 6 months, leaving 51 cases for the present study.

2. Twenty-three (45 per cent.) had left the hospital as recovered or improved at the expiration of this period. Twenty-eight (55 per cent.) were unimproved or worse.

3. The prognostic significance of sex, marital status, time of onset and elapsed period before hospitalization, positive family history, relationship to menopause, effect of treatment, and pre-psychotic personality was investigated.

4. Depressive features, such as agitation, sadness, self-accusatory and self-depreciative ideas, somatic delusions, suicidal threats and attempts, predominated in 78 per cent. of those that got well.

5. Schizophrenic symptoms, such as auditory and visual hallucinations, ideas of persecution, systematized delusions and catatonic behavior were associated with an unfavorable outcome.

6. An analysis of the development and eventual outcome of the case material suggests the conclusion that involutional psychosis might more properly be diagnosed either manic-depressive psychosis or schizophrenia which has occurred late in life. (Author's abstr.)

On the Etiology and the Prevention of Mongolism.

(1) It is the authors' opinion that mongolism is not due to hereditary factors. If it were due to these factors the incidence of mongolism should increase in proportion to the number of offspring according to Mendelian expectation. Although many mongoloid children have 5 to 12 siblings, no multiple incidence of mongolism is found in any of these families. Mental deficiency in a family is no protection against mongolism, but the coincidence does not explain the particular growth disorder of the mongoloid child.

(2) The theory, based mainly on twin research, that mongolism is due to a germinal (plasmatic) disorder does not hold. It is demonstrated that the observations on mongoloid twins are open to various interpretations.

(3) The third theory to explain the occurrence of mongolism is that of a pathologic condition of the mother. The method of analysis which the authors adopted brings in their opinion conclusive evidence that the maternal condition at the time of pregnancy was at fault.

(4) A study of the birth order of mentally deficient children due to germinal factors shows that the birth of a defective child may be expected to occur at any place in the line of siblings. In an unbiased sample of families in which all children are analyzed, as many children are born before the individual with a given characteristic as after the affected individual. In some families the affected child may be born first, in other families last. These differences cancel each other in the long run, and a balance of siblings born before and after the affected child is demonstrable. This point is proven by two lines of control studies; one is made on a material of 4,316 mentally defective children of all types, and the other on a material of 255 hereditary cases at the Wrentham State School. In both independent studies the result was that mental defect as a characteristic is not associated with any particular disturbance of the birth order. In an ideal sample, 50 per cent. of brothers and sisters would be born before and 50 per cent. born after the affected child. In the authors' material, 48 per cent. were born before and 52 per cent. afterwards in one line of studies, and 54 per cent. were born before and 46 per cent. subsequently in the other investigation. This represents a variation which is well within expectation, and offers proof of the theoretical assumption.

(5) In a study of the birth order of mongoloid patients the striking result was found that 84 per cent. of the total number of brothers and sisters was born before the mongoloid and only 16 per cent. afterwards. Comparison with the control group shows that this is a significant deviation.

(6) The imbalance between the number of children born before and after a mongoloid suggests that the birth of a mongoloid indicates the development of a pathologic condition of the mother and bears a definite relationship to her ability to have children.

(7) It is indicated that the decline in the number of children after a mongoloid birth cannot be explained on psychological grounds.

(8) Mongolism occurs mainly under three conditions: (1) At the end of the child-bearing period, when the mother is approaching the menopause; (2) at the beginning of child-bearing, when the mother is immature or when the first child is born after a long period of waiting and the mother shows a delayed adaptability to the condition of pregnancy; (3) in the middle of the child-bearing period due to intercurrent extrinsic factors.

(9) The common denominator for the condition under which mongolism develops is the threshold of sterility. The sterility is caused by a hormonal imbalance, which manifests itself in abortions, bleedings during pregnancy, prematurity and incapacity for conception. The mongoloid deficiency develops in a baby on the threshold of complete maternal sterility. The authors' material indicates that the maternal inner secretory response to a pregnancy is at fault.

(10) A careful inquiry into the birth records of mongoloid children reveals that the birth of a mongoloid child may be expected or even predicted in a certain percentage of cases. From a medical point of view many mothers of mongoloids show indications that they were not in a perfect condition for pregnancy. The suggestion is made that pregnant women whose history indicates the possibility of a mongoloid baby should be subjected to careful biochemical and endocrine studies during prenatal care. Such examination will provide material to determine whether a mother suffers from an endocrine deficiency, and will enable the physician to single out eventually a mongoloid pregnancy. This approach might not secure every case of this disorder, but might serve to reduce the number of mongoloids to a reasonable extent.

(Authors' abstr.)

VOL. C. JULY, 1943.

SEPTEMBER.

The Spirogram in Certain Psychiatric Disorders.

A rapid method of scoring irregularity in the spirogram tracing is described. This method makes use of seven variables, which are added to obtain a numerical score. A series of tracings obtained from 50 anxiety neuroses, 40 hysterics and 10 wartime depressions, 60 schizophrenic patients and 103 normal control subjects were scored. The highest mean score was found for the anxiety group, and the lowest mean scores were found for the schizophrenic and normal groups. The mean values of hysterias and reactive depressions fall between the extremes. Statistically valid differences were found on comparing the anxiety group with the schizophrenic and with the normal control group. The incidence of sighing respirations was 60 per cent. for the anxiety group, 54 per cent. for the group of hysterias and reactive depression, 37 per cent. for the schizophrenic patients, and 21 per cent. for the normal control subjects. The mean value for sighing respiration was significantly greater for the anxiety neuroses when compared with the schizophrenic and normal controls. Major fluctuations (large waves in the tracings) were found significantly greater for the anxiety neuroses than for schizophrenic and normal controls.

The schizophrenic group showed very little difference from the normal control subjects for all of the variables studied with the exception of points off the upper line. In this item the schizophrenic group had a lower mean value, which was statistically significant.

(Author's abstr.)

Bilateral Prefrontal Lobotomy.

The writer collected information from 19 different clinics in the United States and Canada from 1936 to July, 1943, with the following results:

Number operated on	618
Died as the result of the operation	12
Died subsequent to the operation (2 committed suicide)	18
Rendered clinically worse	8
" " unimproved	62
" " slightly improved	109
" " much improved	194

Recovered, all symptoms disappeared	214
,, patient better than ever	1
Still in hospital (but some working)	277
Outside hospital but unable to work	60
,, ,, working part or full time	251

G. W. T. H. FLEMING.

AM. J. PSYCHOL.

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ARCH. NEUR. PSYCHIAT.

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NEW YORK NEUROLOGICAL SOCIETY AND NEW YORK ACADEMY OF MEDICINE, SECTION OF NEUROLOGY AND PSYCHIATRY.

PHILADELPHIA NEUROLOGICAL SOCIETY.

PHILADELPHIA PSYCHIATRIC SOCIETY.

JUNE.

BOSTON SOCIETY OF PSYCHIATRY AND NEUROLOGY.

CHICAGO NEUROLOGICAL SOCIETY.

MICHIGAN SOCIETY OF NEUROLOGY AND PSYCHIATRY.

Electroencephalographic Foci Associated with Epilepsy.

Electroencephalographic studies were carried out on a random sample of 1,161 epileptic patients. Simultaneous records from six cortical areas were made with monopolar leads. In 15 per cent., or 160 cases, electroencephalographic foci were found. In 58 per cent. of these 160 cases clinical localizing signs were present, and in all these cases the clinical and electroencephalographic localizations were in agreement. A corroborating electroencephalographic focus was noted in 87 per cent. of 106 cases with clinical localizing signs or symptoms.

Clinical evidence of localized damage to the brain was fifty-eight times as common in epileptic patients with electroencephalographic foci as in patients in whom the disturbance was generalized or absent. The same types of seizure discharge or other electroencephalographic abnormality were encountered in cases with focal electroencephalographic activity as in cases with non-focal disorders. However, certain types of abnormality, notably irregular $\frac{1}{2}$ to 3 per second activity, spikes and 2 per second waves and spikes, were much commoner in focal than in non-focal records. The presence of one of these three types of abnormality is presumptive evidence of localized damage to the brain. (Authors' abstr.)

Interaction of Electric Shock and Insulin Hypoglycemia: Experimental Investigations.

That electrical stimulation is effective in reducing the loss of weight of denervated muscle has been demonstrated conclusively by a number of workers. With electrical stimulation at maximal strength, the present experiments led to the following conclusions:

(1) Of the types of current tried, the 25 cycle alternating (sinusoidal) current produces the best results with respect to retention of weight, and the 60 cycle current is second best.

(2) Neither galvanic nor faradic current performs consistently better than the other. Both are inferior to the 25 and the 60 cycle sinusoidal current.

(3) The effectiveness of the treatments increases with the number of treatments daily. This relationship is apparently linear.

(4) No sensible differences in results are obtained by varying the length of the treatment within the limits employed (one to five minutes). (Authors' abstr.)

Experimental Swelling of the Brain.

Acute swelling of the brain was produced in dogs by lesions of the lower part of the fourth ventricle and the medulla. This swelling usually appeared with a simultaneous rise in blood pressure, but later the swelling persisted in spite of the fall in blood pressure.

The blood flow through the brain did not show any marked or persistent change in the majority of the experiments.

There was an increase in water content of the gray and the white matter of the swollen brain.

The intravenous injection of hypertonic solutions reduced swelling of the brain in most of the experiments.

The only significant histologic change was dilatation of the perivascular spaces.

The possible explanation of this experimental swelling of the brain induced by lesions of the fourth ventricle is discussed. (Authors' abstr.)

Schizophrenic Language.

1. In standard language usage the frequency of occurrence of the different words in a given sample is mathematically related to the ranks of the words when arranged in order of decreasing frequency, this mathematical relation being a close approximation to an equilateral hyperbola.

2. Utilizing this criterion, by means of its straight line expression on logarithmic graphs, the authors have studied the language behavior of a child (reported by Uhrbrock) and also the speech production of three psychiatric patients with different types and durations of psychoses, as exhibited in spontaneously written personal letters. They found that the curves for all subjects approximated roughly the equilateral hyperbola, but that certain significant deviations therefrom characterized the different subjects.

(*a*) In the intimate personal letters of the patients (as also in considerable control material from personal letters of normal persons) the 10 most common words (essentially articulatory words) were used with considerably less frequency than in more formal discourse directed toward several persons, probably because there was less need for explanatory and definitive terms. This phenomenon was shown on the graphs by a bend toward the left at the top, here called the " top concavity."

(*b*) The child's language production curve was characterized by a slight general concavity, or slightly bow-shaped distribution, the bend (or region of greatest excess frequency) occurring about the region of words of the thirtieth or fiftieth rank.

(*c*) One of the patients, who had a brief schizo-affective type of illness, and who has shown before, during and after her psychotic periods a childishly dependent attitude toward parent surrogates, showed in her language behavior graphs a slight general concavity comparable to that of the child, with the principal bend occurring usually about the region of the fiftieth to the one-hundredth rank. This patient's graph showed also a consistent downward bend at ranks 11, 12 and 13.

(*d*) A paranoid patient showed in his language behavior some small irregular deviations, not very constant from one sample to another.

(*e*) A patient with paranoid schizophrenia showed in her language behavior graph a rigidly systematic deviation from the normal curve in the direction of a consistent, straight and uniform steepness, interpreted by us as an expression of an autistic speech tendency.

3. As a tentative working hypothesis the authors have interpreted their data in terms of opposing tendencies to repetitiousness and to diversification, which they have derived from considerations of economy and convenience; the tendency to repetitiousness tends to increase frequency of use and to diminish the number of different words, whereas the tendency to diversification tends to increase the number of different words and to diminish the relative frequency, the net resultant being a relatively steady proportionality, represented in the equilateral hyperbola. These two hypothetic tendencies have further been illustrated in terms of an analogy with a set of mechanical tools, and our quantitative data have been interpreted in the light of these tendencies and this analogy.

4. The authors have indicated the hypothetic possibility that these two tendencies are equivalent to the consideration of egocentric and allocentric convenience respectively. When they interpreted this type of verbal egocentricity as autism they found that the material of the patient with paranoid schizophrenia was definitely autistic as compared with all the other material presented.

5. The authors have further pointed out how an autistic person could go astray into a distortion of meanings by employing the normal mechanisms of linguistic and semantic changes for his own case, without bothering to meet the normal prerequisite of a social serviceability and a social understandability as necessary for all linguistic and semantic innovations, and that he might then find himself thereby verbally and conceptually handicapped in attempting to solve " neutral problems " set by a tester, and also in dealing with real problems in an actual world. (Authors' abstr.)

Oral and Intravenous Dextrose Tolerance Curves of Patients with Manic-Depressive Psychoses.

In none of the 34 intravenous dextrose tolerance curves obtained on 30 manic-depressive patients were high blood-sugar values exhibited two hours after the intravenous injection of dextrose, except for two curves for patients who also had symptoms of overactivity of the thyroid. The 32 curves which were not prolonged demonstrate that the removal of sugar from the blood stream is not retarded in manic-depressive patients.

In 6 of 30 oral dextrose tolerance curves obtained on 20 manic-depressive patients, the sugar was elevated decidedly above 100 mgm. per 100 c.c. of blood two hours after the ingestion of sugar. These prolonged oral dextrose tolerance curves were observed for patients who had normal intravenous dextrose tolerance curves. It may be concluded that abnormal oral dextrose tolerance values for manic-depressive patients are attributable to delayed absorption

of dextrose from the gastro-intestinal tract, and cannot be accepted as evidence of an intrinsic disorder of carbohydrate metabolism. (Authors' abstr.)

VOL. L. JULY.

NEW YORK ACADEMY OF MEDICINE, SECTION OF NEUROLOGY AND PSYCHIATRY, AND NEW YORK NEUROLOGICAL SOCIETY.

ILLINOIS PSYCHIATRIC SOCIETY.

CHICAGO NEUROLOGICAL SOCIETY AND ILLINOIS PSYCHIATRIC SOCIETY.

Effect of Metrazol Convulsions on Conditioned Reflexes in Dogs.

The course of twelve metrazol convulsions gave varying results, depending on the type of animal. The effect was much more pronounced on the higher, conditioned reflex function than on the lower unconditioned activity. In general there was impairment of cerebral function in the direction of (1) decrease of excitatory conditioned reflexes; (2) loss of inhibition, resulting in lack of differentiation between positive and negative stimuli; (3) lengthening of the latent period; (4) predominance of the activity of some lower centres at the expense of the higher ones; and (5) a long period of recovery. The impairment of function lasted from one to six months, even in the stable dogs. In one extremely excitatory dog, in which inhibition was poor, the lessening of the excitatory conditioned reflexes resulted in apparent improvement in the behavior, rather than in impairment. (Authors' abstr.)

Clinical and EEG Studies on Criminal Psychopaths.

Seventy-five criminal psychopaths were studied both from an EEG and a clinical approach. The characteristics of the group were described. EEG studies revealed 80 per cent. abnormal or borderline abnormal tracings. Survey of the psychopath's developmental history showed that 80 per cent. had psychologically unhealthy factors in childhood. From the available data the following conclusion seems warranted: Psychopathic personality is a mental illness resulting from inborn or early acquired cerebral dysfunction and disturbed parent-child relationship. (Author's abstr.)

Integrated Facial Patterns Elicited by Stimulation of the Brain Stem.

Stimulation of designated areas in the tegmentum of the brain stem of the macaque monkey with the Horsley-Clarke stereotaxic technic produces facial patterns integrated with other somatic and autonomic components into purposeful acts.

The facio-ocular synkinesias of contraction of the orbicularis oculi muscles, upward rolling of the eyeball and constriction of the pupils can be elicited from the reticular substance of the pons 1·5–2·5 mm. lateral to the midsagittal plane.

Contraction of the orbicularis oris muscle in a sucking, swallowing movement is associated with elevation of the base of the tongue, raising of the uvula and inhibition of respiration in the inspiratory phase. This pattern is elicited from the reticular formation of the medulla ·5–1·5 mm. from the midsagittal plane dorsomedial to the rostral part of the inferior olive. A facio-respiratory complex simulating laughter and consisting of retraction and elevation of the corners of the mouth, depression of the lower jaw, lowering of the base of the tongue and uvula and cessation of respiration in the expiratory phase can be elicited from an area ·5–2·0 mm. from the midsagittal plane dorsomedial to the inferior olive.

It is suggested that the facio-ocular and facio-respiratory synkinesias are integrated in the reticular formation of the brain stem. (Authors' abstr.)

AUGUST.

New York Neurological Society and New York Academy of Medicine, Section of Neurology and Psychiatry.

Boston Society of Psychiatry and Neurology.

Chicago Neurological Society.

Electroencephalographic Classification of Epileptic Patients and Control Subjects.

The electroencephalograms of 1,000 adult control subjects and of 1,260 epileptic patients have been distributed on a scale of classifications based primarily on frequency. Each electroencephalogram is assigned to one of 18 categories, 9 of which are regarded as normal, 2 as slightly abnormal and 7 as very abnormal. The distribution for the control subjects forms a simple curve, with the mode at 10 per second. The distribution for a random sample of 730 adult epileptic patients is bimodal, with modes to the fast and the slow side of 10 per second.

No final and absolute value can be ascribed to the incidence of a given pattern in normal subjects, in epileptic patients or in subjects with other clinical classifications because the incidence of all types of normal and abnormal electroencephalograms varies with age and with the criteria used in diagnosis and classification. The greatest difference between the encephalograms of the normal subjects and those of the epileptic patients appears in the five electroencephalographic types classified as paroxysmal, i.e. those manifesting an abrupt and specific alteration of pattern. As compared with the records for the adult controls, the records of epileptic adults classed as paroxysmal are thirty-three times as numerous, those with very slow or very fast frequencies are twenty times as numerous, and those with moderately slow or moderately fast frequencies are twice as numerous. Among children with epilepsy, the *petit mal* variant type of discharge occurs five times, the *petit mal* type two and one-half times, and the *grand mal* type of discharge one and three-tenths times as commonly as among adult epileptic patients, whereas the psychomotor type of discharge and normal rhythms occur one-half and records with fast frequencies one-third as commonly. (Authors' abstr.)

Metabolic Studies on Epileptic Patients Receiving Azosulfamide and Phenobarbital.

1. Adminstration of azosulfamide is accompanied by a decrease in the carbon dioxide content and the carbon dioxide tension of the serum.

2. The decreased carbon dioxide content and the lowered carbon dioxide tension of serum accompany the anticonvulsant effect.

3. The anticonvulsant effects of both azosulfamide and phenobarbital coincide with a positive potassium balance.

4. Ammonium chloride produces the same degree of " acidosis " as does azosulfamide, without alteration of potassium exchange, and does not have an anticonvulsant effect.

5. Phenobarbital produces no " acidosis," but a positive potassium balance, and has an anticonvulsant effect. (Authors' abstr.)

Measurement of Intellectual Functions in the Acute Stage of Head Injury.

The status of consciousness immediately following injury to the head was determined in 190 patients by subjecting them to a series of psychologic tests. Complete failure, failure on serial subtraction alone and impaired performance on several tests represent three degrees of intellectual defect.

Patients with severe head injuries leading to intracranial hematoma, fracture of the skull and a bloody spinal fluid have a higher incidence of total intellectual incapacity, of varying duration,

than patients with short loss of consciousness only. Prolonged coma, delirium and confusion were much more frequent with the severe lesions, and did not occur in patients with simple loss of consciousness.

Examination of 85 patients on three consecutive days by the 100–7 test revealed that accuracy of performance improves more during this period than speed. Complete restitution, however, required a period of weeks. (Authors' abstr.)

Histogenesis of the Early Lesions of Multiple Sclerosis. II: Acute Multiple Sclerosis.

The essential features of the acute lesions of multiple sclerosis may be summed up as follows:

Macroscopically the patches appear as small areas of softening and necrosis. Microscopically they are characterized by (1) a destructive process in which myelin sheaths as well as axis-cylinders are severely damaged; (2) formation of circumscribed areas of softening and necrosis; (3) excessive cellularity, due to an abundance of gitter cells mixed with lymphocytes and cytoplasmic glia cells; (4) absence of glial fibrosis; (5) a slight degree of repair through moderate proliferation of connective tissue; and (6) pronounced congestion and thrombosis of small veins.

Lesions closely resembling those described in cases of acute multiple sclerosis have been observed in typical cases of chronic multiple sclerosis in which an acute exacerbation of the clinical symptoms preceded death.

The view is expressed that the acute and the chronic form of multiple sclerosis are varieties of the same morbid entity. The structural difference in their lesions can be explained by the difference in intensity and duration of the same morbid process. (Author's abstr.)

SEPTEMBER.

New York Academy of Medicine, Section of Neurology and Psychiatry, and New York Neurological Society.

Chicago Neurological Society.

Philadelphia Neurological Society.

Tuberous Sclerosis.

The authors present a study of a series of 25 patients with tuberous sclerosis in which the frequency of many of the conditions associated with this syndrome is further established. Two additional anomalies not previously reported are described. A detailed description of the pathologic features of the retinal tumors present in one patient is added. The chief diagnostic roentgenographic change, that of patchy zones of increased density in the skull, is conclusively shown to be located in the calvarium. Further evidence is adduced that tuberous sclerosis is a developmental tissue dysplasia. (Authors' abstr.)

Histologic Studies of the Brain Following Head Trauma. III: Post-Traumatic Infarction of Cerebral Arteries, with Consideration of the Associated Clinical Picture.

Attention is called to the incomplete clinical understanding of the edema and hemorrhage resulting from trauma to the brain and of the associated disturbances in circulation of the cerebrospinal fluid.

Six cases of epidural and subdural hematoma in which the mesial portion of the temporal lobe was displaced over the free edge of the tentorium are described, including the clinical history and the gross and histologic changes in the brain.

In two of these cases classic infarctions in the distribution of the posterior cerebral artery were displayed. In two cases, in addition to the well-known uncal herniation, herniation of the supracallosal gyrus under the free edge of the falx was present. There resulted therefrom infarction in the course of the anterior cerebral artery, in addition to the infarction in the course of the posterior cerebral artery related to the uncal herniation.

In the fifth case, in which the uncal herniation was unusually full, interference with flow in the middle cerebral artery resulted, producing infarction in the distribution of that vessel, in association with a lesser degree of infarction in the course of the posterior cerebral artery.

In the first, fourth, fifth and sixth cases there were associated histologic changes in the brain stem, and physiologic changes were also present, as indicated by signs of decerebration of varying degrees.

The role of edema in the production of the herniations is emphasized.

It is argued, on histologic grounds, that reduction of flow in any one of the major cerebral arteries is of itself not an adequate explanation of the resultant red infarction of portions of a hemisphere. To the arterial disturbance must be added interference with free venous outflow from the affected area.

The same mechanism, reduction in arterial inflow and interference with venous outflow, is thought to be an adequate explanation of the hemorrhages in the brain stem so often seen in association with epidural and subdural hematomas.

Attention is drawn to the importance of edema of the brain stem, a precursor of hemorrhage.

The clinical picture presented by these cases is discussed; and an effort is made to draw practical lessons from the information derived from consideration of the histologic picture. Most important is the early evacuation of the clot. Decerebration is a bad prognostic sign. Administration of oxygen and suction of material from the bronchi by an endotracheal tube are important steps in emergency treatment. The value of hypertonic solutions is thought to be questionable. Lumbar puncture, if employed at all, must be used with full realization of the mechanical factors and the risks involved. (Authors' abstr.)

Genealogic and Clinicopathologic Study of Pick's Disease.

This study lends support to the view expressed by some previous investigators that Pick's disease is a heredo-degenerative disorder. Such a conclusion is based on the definite pattern of dominant inheritance in the two families the authors report, and on the evidence that the condition develops as a system disease in the genetically youngest cytoarchitectonic regions, with corresponding disturbances in the highest cortical functions. The relatively minor discrepancies in the anatomic picture can in no way invalidate the significance of the principal observations. (Authors' abstr.)

Convulsant Shock Treatment of Patients with Mental Disease by Intravenous Injection of Acetylcholine; Electroencephalographic and Electrocardiographic Observations.

1. The effect on patients with mental disorders of the intravenous injection of large doses of acetylcholine chloride has been investigated.

2. These doses of acetylcholine produced mild convulsions associated with cardiac arrest and loss of consciousness, lasting 30 to 50 seconds.

3. A series of convulsions produced by acetylcholine had no ameliorating effect on the mental condition of the patients studied.

4. The significance of the studies with regard to the mechanisms of shock therapy in general is discussed.

5. Acetylcholine convulsant therapy does not appear to be a desirable procedure.

(Authors' abstr.)

OCTOBER.

ILLINOIS PSYCHIATRIC SOCIETY.

BOSTON SOCIETY OF PSYCHIATRY AND NEUROLOGY.

Conduction of Cortical Impulses and Motor Management of Convulsive Seizures.

Groups of electrical discharges originating in the resting motor cortex under barbiturate anesthesia are conducted in the large projection systems of the cortex, the pyramidal tracts and the corpus callosum.

The impulses conducted in the pyramids do not reach, or at least do not stimulate, the lower motor neuron; those conducted in the corpus callosum, similarly, do not appear on the opposite motor area.

Cortical discharges during convulsive seizures and those following the application of strychnine or picrotoxin to the cortex result in conducted axonal spike activity in the pyramidal tracts and in a number of extrapyramidal pathways running through the medial and lateral reticular substance. The activity in the pyramidal tracts occurs in bursts and groups of spikes synchronous with the cortical discharges, while the extrapyramidal activity is more continuous.

On several occasions groups of impulses were recorded from the area of the nuclei of the posterior column and from the region of the medial lemniscus. This activity is considered to be proprioceptive sensory return.

Section of the corpus callosum causes a rise in the seizure threshold and appears to shorten the duration of the seizure. During generalized seizures in these instances cortical discharges were equal on the two sides.

Section of one or both pyramids causes pronounced changes in threshold and duration of the seizures, but the pattern of tonic and clonic movement is not abolished, even by complete bilateral pyramidotomy.

The use of various anesthetics resulted in appreciable modifications of both the cortical discharge patterns and the clinical seizure patterns.

The anatomic origin of the large cortical projection systems is discussed in conjunction with present knowledge of the origin of the electrical discharges of the cortex at rest and during seizures.

An attempt is made to outline the functions of various structures involved in the motor management of convulsive seizures. (Authors' abstr.)

Effects of Morphine on Learned Adaptive Responses and Experimental Mental Neuroses in Cats.

1. In four out of five cats morphine in doses of approximately 1 mgm. per kilogram of body-weight regularly produced refractoriness to stimuli and diminution in activity, lasting from one-half to two hours, after which the animal became more restless and evinced notable distractibility over a period of about six to seven hours. The fifth cat exhibited only the latter type of behavior with this dose of morphine.

2. In all animals learned adaptive responses were greatly affected. The more recently acquired and most complex learned responses disappeared first, and then reappeared last, as the effects of the drug wore off. The disintegration of learned complex responses was usually complete within ten minutes after injection, while reversal of this process began three or four hours later in most cases.

3. "Experimental neuroses" were produced by creating an impasse between conflicting motivations of hunger and fear. The complex "neurotic" behavior abated with injection of morphine, and was replaced by previous adaptive patterns about five or six hours after the administration of the drug. However, in three of the animals the "neurotic" behavior reappeared in full force after the effects of morphine had worn off further, although a cat which had been made only mildly "neurotic" showed notable diminution in its abnormal reactions the next day. In contrast, an animal with a reprecipitated and severe neurosis showed no improvement with doses sufficiently large to cause its death. (Authors' abstr.)

Prognosis of Multiple Sclerosis.

A clinical study of the prognosis of multiple sclerosis based on the life charts of 55 patients, beginning with the initial episode, is presented. Three clinical types of disseminated sclerosis are recognized: the acute, the remittent and the chronic progressive.

The clinical course in a case of Devic's disease (neuromyelitis optica) did not appear to differ from that of the remittent type of multiple sclerosis.

Twenty-seven patients had optic neuritis at some stage of their disease. In only one patient, however, were both optic nerves affected at the same time. The prognosis for the optic neuritis of multiple sclerosis is generally good; only one of the patients became completely blind. Optic neuritis may usher in the disease or, contrary to some opinions, may occur later in its course, years after other episodes have supervened. Seven patients showed visible swelling of the optic nerve.

The prognosis is good for the individual attack in the remittent form of multiple sclerosis. The prognosis with respect to life is good in both the remittent and the chronic progressive form. The prognosis for life is hopeless in the acute form. Persons suffering from the remittent type may be able to lead useful lives for many years; in rare instances complete recovery occurs.

Apoplectic episodes are not uncommon, having been experienced by 12 of 50 patients with the remittent type. The percentage probably would be higher if apoplectic episodes were sought for diligently in the history of all patients.

No type of therapy advocated at present is of any value. (Authors' abstr.)

Muscular Tension in Psychiatric Patients: Pressure Measurements on Handwriting as an Indicator.

A method of measuring the grip pressure and the point pressure during the continuous movement of handwriting was used for a series of 40 patients with various psychiatric and neurologic diagnoses and for a series of 12 normal control subjects.

On writing the same standard sentence the patients showed higher values for grip pressure, a greater number of phases and a longer writing time than did the control subjects. These differences were statistically significant.

The patients gave a greater number of positive answers to questions concerned with feelings of excitement, nervousness, tiredness, trembling inside, shaking and tension in the arms and fingers.

A significant correlation was found in the psychoneurotic and the psychotic patients between feelings of neuromuscular tension and high values for point pressure. No correlation was found between feelings of general tension and any of the pressure readings. (Authors' abstr.)

Prevention of Hemorrhages in the Brain in Experimental Electric Shock.

Preparatory injections of atropine sulfate, synthetic vitamin K, calcium gluconate, a thromboplastic suspension of brain substance and various combinations of the last three preparations prior to electrically induced convulsions failed to prevent hemorrhages in the brains of experimental rats. Since no hemorrhages were seen in animals in which convulsions had been completely prevented by ether narcosis, it was concluded that the changes in pressure accompanying the convulsion, and not the current itself, represent the causative factor in the formation of such lesions. (Author's abstr.)

ARCH. PATH.

VOL. XXXV. JUNE, 1943.

VOL. XXXVI. AUGUST.

SEPTEMBER.

Hypertensive Disease of the Brain.

The characteristic histologic features of hypertensive encephalopathy observed in 25 cases are reported and two cases are described in detail.

Typical vascular alterations, confined to the arterioles and capillaries, were observed in all cases, and consisted of hyaline degeneration and fibrotic thickening of the walls associated with narrowing or obliteration of the lumens. These arteriolar changes should be considered as a special form of arteriolopathy typical of hypertension, and different from those found in the usual case of arteriosclerosis. A working hypothesis presumes that the characteristic arteriolar change may be due to functional vascular disturbance of prolonged duration or of repeated occurrence.

Changes in the parenchyma of the brain consisted of diffusely scattered, circumscribed small foci of old and recent softening, perivascular hemorrhage, massive hemorrhage and diffuse or localized edema of the brain. The view is expressed that the alteration of the brain-tissue is secondary to the arteriolar changes. (Author's abstr.)

OCTOBER.

ARCH. PSYCHOL., N.Y.

VOL. XXXIX. MARCH, 1943.

BRAIN.

VOL. LXVI. JUNE, 1943.

On the Mode of Representation of Movements in the Motor Cortex, with Special Reference to Convulsions Beginning Unilaterally.

The so-called "classic" theory of the cortical representation of movements proposes a cortical mosaic of "points" in the excitable motor cortex, each of which represents a single small movement, sometimes one activating but two muscles reciprocally. Leyton and Sherrington suggested that it is the function of the motor cortex as a whole to synthesize these fractional components into those combinations and sequences of larger movements that characteristically make up the normal motor activities of the organism. They also pointed out that a given cortical point responds to stimulation in various ways, determined by the stimulation factors to which it is exposed. Thus a point that at one moment yields no response may be responsive at another; repeated threshold stimuli have two effects—they augment the responses from the point stimulated and may alter ("deviate") the response from adjacent points; even reversal of response may be obtained. This implies an instability of localization, a breaking down, as Dusser de Barenne puts it, of the relations between cortex and musculature. There is yet another assumption in the theory, namely, that the item of movement revealed by a brief threshold stimulation of the cortex is a normal unit of co-ordinated movement.

It is submitted that this theory does not adequately generalize the facts of clinical or experimental observation. These indicate that it is the normal movement combinations and sequences of normal activity that are represented, and this not on the plan of a mosaic of contiguous "localizations" but on a plan of wide and overlapping fields, each of which has a focus wherein the movements of a given motile part are mainly, but not exclusively, localized. The variations in response of a given cortical point to stimulation are not due to any breaking down of the localization, but to variations in the threshold of excitability of the different movements "localized" at this point. Facilitation is the process underlying this variation, and deviation of response is a consequence of this facilitation.

The phenomena of Jacksonian convulsions and of hemiplegia also afford support to the hypothesis of widespread fields of localization that Jackson formulated, and are inexplicable on the basis of the punctate theory of localization. (Author's abstr.)

Reflex Studies in Electrical Shock Procedure.

The electrical shock procedure produces considerable though transitory changes in the normal reflexes, and originates many pathological reflex phenomena.

The deep reflexes reveal a range of susceptibility in which the knee-jerk is the most inclined to suffer.

The behaviour of the supinator jerk is at variance with the reactions of all other deep reflexes and occupies a singular position among them.

A similar scale of susceptibility could be observed in the superficial skin reflexes, the abdominal being the most vulnerable.

The corneal reflex does not change at all, thus representing the only exception among all other common clinical reflex phenomena.

The occurrence of Babinski's sign is the rule. Different features of this reflex could be observed and brought into a quantitative sequence.

In spite of the spasticity of the legs and a strong ankle-clonus Rossolimo's sign could never be obtained.

In a large proportion of cases a grasp phenomenon has been found, and its occurrence has been related to the character of the mental disorder.

The behaviour of the phalangeal joint reflex is described and its relationship to the grasp phenomenon and Babinski's sign discussed.

A comparison is made between reflex phenomena in the post-convulsive phase of electrical shock procedure and those in organic disorders of the central nervous system.

(Author's abstr.)

SEPTEMBER.

BRIT. J. EDUC. PSYCHOL.

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NOVEMBER.

BRIT. J. MED. PSYCHOL.

VOL. XIX. JUNE, 1943.

The Repression and the Return of Bad Objects.

In the past the attention of analysts has been successively focused, first upon impulse and later upon the ego. The time is now ripe for a psychology of object-relationships—that is, a study of the relationships of the ego to its internalized objects. The view is formulated that what are primarily repressed are neither intolerably guilty impulses nor intolerably unpleasant memories, but intolerably bad internalized objects. Only when repression fails to prove an adequate defence against internalized bad objects and these begin to threaten the ego are psychopathological defences called into operation. Much of the rest of the paper is concerned with the defence of the super-ego, defence of guilt or moral defence with special reference to military cases. S. M. COLEMAN.

Principles of Aetiology.

A review of some theories of causation and their application in medical practice, general and psychiatric; more particularly the mechanismic theory, the biological theory and the theory of final causes are examined. There is also a short reference to Hume's opinions regarding cause and effect. S. M. COLEMAN.

The Psychology and Treatment of Alcohol Addicts.

(*a*) The addiction neuroses differ from the other groups of neurosis, not in kind but in degree only:

By the extremely strong self-destructive element, both bodily and mental, which finds its psychological expression in the addict's neurotic habit of indulging in death-fantasies.

By the extraordinarily narcissistic glorification and expansion of the ego.

By the ever-increasing and finally complete identification of the patient with the world of illusion, in the final stages of which no compromise with reality is possible.

(*b*) The treatment of the poisoned mind consists in the systematic indefatigable application of exact psychotherapy, especially of psychoanalysis. S. M. COLEMAN.

Tests in the Diagnosis of Mental Deficiency.

Performance tests have a special value in that they disclose orectic as well as intellectual factors relevant to a diagnosis of mental deficiency.

Performance tests of the type used are of value for diagnostic purposes because they make little demand on abstract or symbolic thinking, and only a limited demand upon imaginal or memory control, and enable a differentiation of men to be made according to their capacity to deal with material present to the senses.

Performance tests are of value in differentiating the intellectual defective from the personality defective and from the scholastically undeveloped. S. M. COLEMAN.

The Scope of Speech Pathology.

On the basis of evolutionary considerations an attempt is made to demonstrate in outline the principal speech and voice disorders, which cover a wider field than is usually assumed. S. M. COLEMAN.

The Vagina Dentata Legend.

The discovery of the Vagina Dentata dream and legend in the remoter states and districts of central India is of great interest as establishing parallel psychological development among people as diverse as the Baiga of India, the Chilcotin of north-west America and the Ainu of Siberia.

All the stories testify to a very widespread belief that sexual intercourse is often defiling and often dangerous. It does not appear that here this danger is due to the infection of hymeneal blood, but is the result of a complex psychological situation, in which a recognition of the toxic character of menstrual blood, the possibility of venereal contagion, the exposure of both male and female to hostile magic and witchcraft at the moment of sexual congress, the universal latent dread of castration and the fear of impotence with all its social and domestic embarrassments are contributory factors. S. M. COLEMAN.

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VOL. XXXIV. SEPTEMBER, 1943.

BULL. CANAD. PSYCHOL. ASS.

VOL. III. 1943.

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VOL. VII. MAY, 1943.

JULY.

CHARACTER AND PER.

VOL. XI. MARCH, 1943.

Concerning Rigidity.

Primary and secondary rigidity must be distinguished.

Primary rigidity involves sequelae of an abnormality of the Einstellung mechanism, most frequently observed in lesions of the subcortical ganglia. Each performance in action immediately becomes so rigid that responses to extraneous stimuli cease. Secondary rigidity is due

to a primary defect of the higher mental processes occurring in cortical damage and cortical malformations, such as feeble-mindedness. It occurs only if the individual is confronted with tasks beyond his capabilities.

The following theoretical interpretation is offered: (1) Rigidity occurs when an organism is unable to come to terms with "its" environment in an "adequate" way. It is a means of protection against "catastrophic conditions." (2) Rigidity is one type of reaction to a situation to which the individual is inadequate. Distractability and other types of reactions may also result from catastrophic conditions. Rigidity in feeble-minded children is a consequence of a mental deficiency, especially of the impairment of abstract attitude.

Normal individuals may also exhibit rigidity under certain conditions, namely, in performances beyond their capacities.

The implications of this theory for education of feeble-minded children are stressed.

(Author's abstr.)

JUNE.

CONFINIA NEUROL.

VOL. IV. 1942.

DIS. NERV. SYST.

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MAY.

JUNE.

JULY.

AUGUST.

Cerebral Anoxia.

Cerebral anoxia, always vital, is becoming increasingly important with the development of flight at high altitudes. Various causes of cerebral anoxia have the same clinical, pathologic and physiologic effect. This effect depends on the severity and duration of anoxia. Cerebral anoxia may produce a number of mental and neurologic signs and symptoms. At first there may be no recognizable pathologic change; later, chromatolysis and other similar associated changes may occur which may be considered reversible. If anoxia is severe and prolonged, irreparable brain damage will occur, from which there is little hope of recovery. Residual symptoms may indicate involvement of peripheral nerves, spinal cord, basal nuclei, or cerebral or cerebellar structures. Pathologic changes in such cases may consist grossly of necrosis of the lenticular nuclei, and also of small foci of degeneration of the cerebral cortex and white matter. Nerve cells disappear or become pyknotic. There may be proliferation of glia and blood vessels. Axones may degenerate. The microscopic changes are pronounced throughout the brain. They are most severe in the basal nuclei; and they may be marked in the olivo-cerebellar system. (Authors' abstr.)

EPILEPSIA.

GENET. PSYCHOL. MONOGR.

INDIAN J. PSYCHOL.

INT. J. PSYCHOANAL.

J. ABNORM. SOC. PSYCHOL.

CLINICAL SUPPLEMENT.

JULY.

J. APP. PSYCHOL.

VOL. XXVI. 1942.

J. COMP. NEUR.

VOL. LXXVIII. JUNE, 1943.

Extensive Unilateral Cerebral Removals in the Primate: Physiologic Effects and Resultant Degeneration.

1. Until the level of the posterior commissure is reached, progressively more extensive unilateral cerebral removals produce a gradually progressive degradation in the motor performance of simians rather than an abrupt paralysis.

2. Monomanual feeding with the involved hand is impaired after frontal lesion, but does not completely disappear until the striatum (J 33) is removed. There is also impairment in the full extension and flexion of the joints, except during struggling.

3. There is much less "spasticity," as measured by resistance to passive movement, the assumption of specific postures, lowering of reflex threshold, increase in the force of reflexes, extension of the reflexogenous zone and spreading of reflexes, after hemidecortication alone than after removal of both cortex and caudate and/or putamen.

4. Superposition of striatal ablation upon hemidecortication causes little specific further loss of motor capacity (it does destroy monomanual feeding), and animals so affected still preserve a rather full complement of associated movements, including bimanual feeding and the ability to climb. It is important to observe that there is a new and notable tendency for the affected limb to participate in useless gestures and antic activity when movements are initiated in the sound limbs. Such animals never develop fibrous contractures.

5. The additional removal of the pallidum impairs the ability to perform associated movements, notably the use of the affected hand in climbing up and bimanual feeding. It also initiates a slowly progressive resistance to passive movement. Immediately after removal of cortex, striatum and pallidum, from one side, the animal shows no marked difference aside from the impairment in associated movements from one lacking only cortex and striatum but, as time goes on, the amplitude of a reflex such as the patellar is progressively restricted and the easy hinge-like freedom of reflex movement at the knee-joint is impaired, the whole leg hopping at the hip instead of being extended at the knee. Such animals usually carry the affected upper limbs in a specific posture of semi-flexion when not in use. There is notable resistance to passive movement, but fixation of the joints, as a result of fibrous contractures, does not occur. The affected limbs engage in activities in which, in the unoperated animal, they normally remain at rest. Their participation in these activities impairs the efficiency of performance of the unaffected limbs.

6. Removal of one half of the cerebrum, at the level of the posterior commissure, results in the immediate loss of movements in all the joints of the affected extremities except a small amount of activity at the axial-appendicular junctions. The position of the limbs with the animal in the vertical position is nearly identical with that seen in lesions producing unilateral rigidity, excepting, that the contralateral extremities are affected and the lower extremity is forcibly flexed by the animal's weight when sitting. These positions are immediately produced by the operation, and are actively retained as a result of the sustained contraction of the muscles producing them. In the early post-operative days the activity of the musculature can still be overcome by the examiner, but fixation of the joints as a result of fibrous contractures rapidly ensues. Attempts to move the limbs, passively, then become unfruitful and painful.

7. The foregoing conclusions indicate that, in the monkey, the thalamo-cortical circuit is

required, not only for discriminating movements of the small musculature, but also for the fullest utilization of large muscle masses; that elaborate automatic and complex associated movement patterns require the integrity of the thalamo-pallidal circuit, but that relatively simple automatic and associated movements, such as walking, do not; that these latter simple automatic movements become lost or submerged in a state of sustained resistance to passive movement when the subthalamus is lost, and that the highest degree of overactivity of the patellar reflex is associated with combined cortico-striatal loss rather than with loss of the cortex alone.

8. Of the cortical fibers to the striatum, approximately half come from frontal and half from non-frontal cortex. Only about one-fifth of all those from the frontal region originate in area 4.

9. There is little evidence that the thalamus projects upon the striatum, but all of the diffuse and lateral parts of the substantia nigra appear to discharge on it.

10. The pallidum appears to receive fibers from the centromedian nucleus. The compact part of the substantia nigra also discharges upon it. (Author's abstr.)

J. COMP. PSYCHOL.

A Study of "Experimental Neurosis" in the Rat by the Conditioned Response Technique.

The present experiment is concerned with studying the type of experimental neurosis described in higher animals by such investigators as Pavlov and Liddell. Specifically, it is designed to employ a previously established conditioning methodology for an evaluation of the determining conditions of experimental neurosis as described by the Anderson-Liddell theory. According to the formulation, this behavior disturbance is a function of tension, capacity for tension, and restraint. Four animals were taken from the regular stock used in the Psychological Laboratory of the State University of Iowa and four from a strain of non-emotional rats. This procedure was used in an effort to learn if a relationship exists between capacity for tension and emotionality as defined by Hall. To vary degree of restraint, half the animals were subjected to more physical restriction, namely, having the hind legs tied, than is ordinarily used in the method. The major part of the experiment was devoted to measuring specific and general behavior changes on evidences of tension as the difficulty of the discrimination problem was increased and when punishment was added.

Findings concerning the development and effect of increasing the difficulty of discrimination are summarized as follows:

(1) In terms of the median number of trials required to reach the criterion of differentiation, the first level was most difficult; the others were learned at a steadily increasing rate through the middle ranges, and then with a decreasing rate as the threshold was reached. This is in agreement with Pavlov's findings.

(2) An increase in the difficulty of the discrimination was accompanied by an increase in excitable behavior, which was heightened further by the introduction of shock.

(3) At the limit of differentiation there was an increase in frequency and variability of responses to the negative stimulus.

(4) The introduction of increased punishment (shock) for errors at the limit of differentiation led to the development of avoidance reactions.

(5) Following prolonged training at the limit of discrimination, three of eight subjects failed to relearn the primary differentiation after 100 trials.

Findings relative to the effect of increased restraint are:

(1) Excitable behavior was more pronounced in the leg-restricted than in the leg-free animals during most of the phases of the experiment.

(2) There was no relationship between degree of restriction and loss of previously established habits after training at the limit of discrimination.

And finally, findings concerning differential behavior of the type of animals used are as follows:

(1) Excitable behavior was more pronounced in the non-emotional animals during most phases of the experiment.

(2) One animal's behavior was more extreme than the other, and for this reason was studied under special conditions.

(3) In terms of habit change there was no marked difference between types of animals.

In general, the behavior observed in the present experiment was similar to that reported by Liddell and Pavlov, who used the conditioned response technique. It was pointed out that although only excitable behavior was displayed in this experiment, in a previous study with a similar set-up only inhibitory behavior was revealed. These different forms of behavior were obtained under conditions which would be described by Pavlov as involving different amounts of internal inhibition.

The results are further discussed in relation to the Anderson-Liddell theory of experimental neurosis. (Author's abstr.)

OCTOBER.

The Effect of Electroshock Convulsions on the Acquisition of a Simple Running in the Rat.

Twenty-two albino rats were given seven early learning trials in a simple running situation. Eleven of these animals, comprising an experimental group, were subjected to a series of ten electroshock convulsions. Eleven, comprising a control group, were accorded identical treatment during the inactive period with the one exception of the shock. When placed back in the learning situation, no difference in habit retention was recorded. A temporary discrepancy in learning ability was explained in terms of emotional rather than cognitive disturbances. (Author's abstr.)

Symptoms of Experimental Catatonia in the Audiogenic and Electroshock Reactions of Rats.

The authors describe the motor phenomena in the audiogenic and in the electroshock reactions of rats. Hyperkinesia in different forms, catalepsy and negativism observationally identical with any other occurrence of experimental catatonia were demonstrable.

In the electroshock reactions it is of interest that the catatonic phenomena appeared not only in the subconvulsive reactions but also were manifest transitorily after generalized seizures. This observation is in accordance with other instances of experimental catatonia, where a quantitative relationship exists between epileptic reactions and catatonia. In the case of chemically induced experimental catatonia, for example, epileptic features occur when an overdose is given. The same relationship holds true for the catatonic phenomena evoked after experimental anoxemia. So, too, as indicated elsewhere by one of us, the audiogenic reaction, or the reaction of abnormal behavior with the " molding, plastic " features described by Maier and others, is characterized primarily by the behavior which the authors have here specifically related to the syndrome of experimental catatonia, but occasionally this noise-induced reaction is marked by a convulsive phase with a well-defined tonic state and other features of a generalized or epileptic convulsion. (Authors' abstr.)

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VOL. V.

J. EXP. PSYCHOL.

VOL. XXXII. MAY, 1943.

Problem Solution by Monkeys Following Bilateral Removal of the Prefrontal Areas. II: Delayed Reaction Problems Involving Use of the Matching-from-Sample Method.

(1) Two rhesus monkeys, following bilateral removal of the prefrontal areas, were tested on spatial and non-spatial delayed reaction problems. These were run using a matching-from-sample technique.

(2) Both animals solved spatial delayed reactions using the matching-from-sample method of stimulus presentation. The maximal delay intervals successively bridged were 30 seconds and 10 seconds for Subjects 54 and 55 respectively.

(3) Both monkeys responded effectively to short non-spatial delayed reactions when a variation of the matching-from-sample method was used. Subject 54 solved 10-seconds non-spatial delayed reactions and subject 55 solved 5-seconds non-spatial delayed reactions.

(4) The data of this paper indicate that monkeys following bilateral removal of the prefrontal areas can respond successfully to delayed reaction problems when tested by means of a matching-from-sample technique.

(5) The data of this paper in conjunction with the data of similar researches do not support the hypothesis that bilateral prefrontal lobectomy destroys any particular ability, but suggest that a number of functions are impaired. (Authors' abstr.)

The Production of Audiogenic Seizures by Interrupted Tones.

The effectiveness of intermittent sound stimulation has been studied in an attempt to define further the stimulus conditions required for eliciting audiogenic seizures in rats. The stimulus used in the present experiment was a 4,000-cycle tone at 134 ± 8 db. (above 10^{-16} watts per $cm.^2$), interrupted in such a way that a known interval of silence followed a known interval of sound. The duration of the sound-silence cycle was varied as well as the ratio of sound to silence.

At a sound-to-silence ratio of 1 : 1, the stimulus becomes more effective as the sound-silence

cycle decreases from 10 seconds (5 seconds on, 5 seconds off) to about 1 second (1/2 seconds on, 1/2 seconds off). Cycles shorter than 1 second are just as effective as a steady tone in eliciting seizures.

At a ratio of 1 : 3, the 1-second cycle (1/4 seconds on, 3/4 seconds off) is practically ineffective, but cycles shorter than this cause progressively more seizures. At a given cycle duration the 1 : 1 ratio always elicits more seizures than the 1 : 3 ratio.

The latent period for the seizure was approximately the same for all the different types of stimuli. (Authors' abstr.)

JUNE.

Cortical Localization of Symbolic Processes in the Rat. III: Impairment of Anticipatory Functions in Prefrontal Lobectomy in Rats.

In his development of a conditioning theory of maze behavior Hull has postulated a "goal gradient" responsible for an increase in rate of speed as an animal approaches a goal, and a fractional goal reaction ("anticipatory gradient") considered to underlie a terminal retardation in rate of running which appears near the goal in the later stages of maze training. The first, we thought, involves simple conditioning processes, and the second symbolic processes at a higher level. Since other experiments had indicated that symbolic functions in the rat depend primarily upon the prefrontal areas, the hypothesis was formulated that prefrontal lesions in the rat should abolish the anticipatory gradient, but leave the goal gradient, in the speed of locomotion in the maze.

Eight rats were operated for removal of the prefrontal areas, and eight normal animals were matched with them in respect of age, sex, and weight. After preliminary training and adjustment to a 24-hour feeding schedule, the two groups were run on an enclosed maze 18·4 ft. long and consisting of eight right and eight left turns in single alternation. Five trials a day were given for 13 days. Time was taken on three sections of the maze.

During the first few days (1–5) the normal rats showed a goal gradient throughout all five trials. In the next days (6–9), a terminal retardation (anticipatory gradient) appeared toward the end of the run, and especially in the later trials of the day. Then, in the last four days of testing (10–13), the goal gradient tended to be abolished and the anticipatory gradient was operative throughout the whole run. The prefrontal rats, on the other hand, showed a goal gradient in the first few days, just as did the normal rats, but as training was continued, the goal gradient became even more pronounced and there was no sign of an anticipatory gradient.

The experiment confirms, moreover, the hypothesis that the fractional goal reaction in maze behavior involves symbolic processes, and that such processes are mediated by the prefrontal cortical areas of the rat. The differential effect of cortical lesions upon goal gradient and anticipatory gradient points to the conclusion that different types of psychological function are reflected in these respective gradients. The results were presented as an illustration of the way in which psychoneural investigations can contribute to learning theory by the sorting of behavioral functions into classes in a way not possible in behavioral studies alone.

(Authors' abstr.)

Problem Solution by Monkeys Following Bilateral Removal of the Prefrontal Areas. III: Test of Initiation of Behavior.

(1) Two rhesus monkeys following bilateral removal of the prefrontal areas and two intact rhesus monkeys were tested on a test of "initiation of behavior." This problem required only that the subject remove food from one of two metal plates in a limited time interval.

(2) The operated animals made significantly poorer scores than the normal animals on those trials in which food was exposed on the food platform for a single second. This difference did not result from lack of familiarity with the problem, as indicated by the fact that significant difference did not appear at the longer exposure intervals. No significant difference was found between normal and operated subjects in the percentage of errors made on the reversal as compared with the non-reversal trials at any exposure intervals.

(3) These data show that bilateral removal of the prefrontal areas in monkeys may produce loss in a simple problem not involving the formation of new associations or the utilization of any symbolic process. (Authors' abstr.)

The Course of Acquisition of a Conditioned Response of the Occipital Alpha Rhythm.

The acquisition curve for the conditioned response of the occipital alpha rhythm to voluntary clenching of the fist was determined by using a conditioning procedure in which one-half of the trials were reinforced. The curve was an accelerated one, nearly the mirror-image of the extinction curve. The curves of acquisition and extinction for EEG conditioning are similar to those obtained when peripheral responses are conditioned. The effect of a conscious attitude of " expectancy " was investigated by telling the δs whether or not to expect a light. It was found that, after a short reinforcement series, responses were given when a light was not " expected." These trials yielded an extinction series. Responses were always given when light was expected. It was concluded that the effect of conscious " expectancy " in the formation of the conditioned response is limited. (Authors' abstr.)

A Comparison of Eyelid Responses Conditioned with Reflex and Voluntary Reinforcement in Normal Individuals and in Psychiatric Patients.

A comparison of eyelid responses conditioned with reflex and voluntary reinforcement in normal individuals and psychiatric patients indicates that—

Although the same wink movement was under study in each case, the type of conditioning which arises through voluntary reinforcement differs from that arising through reflex reinforcement in its descriptive characteristics, its course of development and in its type of extinction. VCRs exhibit the post-extinction recovery, with lapse of time of a characteristic fashion, as do RCRs.

There are negligible differences in the course of acquisition of either the RCR or the VCR between normal individuals and psychiatric patients.

There is some evidence of a greater perseveration of the learned activity of the VCR in psychiatric patients. (Authors' abstr.)

Maze Behavior of the Rat after Electroshock Convulsions.

Twenty-eight rats which had learned a two-decision point, right-left T maze under hunger and food reward motivation, were divided into two groups of 12 and 16 animals. One group was given one electroshock convulsion every day for 30 days, and both groups were put back in the maze 20 days after the last convulsion of the electroshock animals.

The only objective evidence of maze habit retention in the electroshock rats was seen in the relearning-time scores relative to the initial learning-time scores of the same group. The relearning-time scores of the experimental animals, however, were significantly greater than those of the control group.

Relearning error scores of the electroshock rats relative to initial learning errors of the same animals were not significantly different. Relearning error scores of the electroshock group were significantly greater than the relearning errors of the control group.

The possibility that the errors of relearning of the electroshock animals were conditioned by the " emotional " behavior induced by the electroshock convulsions must be considered before it is concluded that a long series of electrically-induced convulsions effects an enduring organization of the finely discriminative cognitive structural trace of a recent maze habit.

(Author's abstr.)

OCTOBER.

J. NERV. MENT. DIS.

VOL. XCVII. MARCH, 1943.

Research in Schizophrenia.

Previous psychological investigation has tended to single out an individual psychological capacity or a clinically outstanding symptom, instead of placing changes in the total personality in the foreground.

Applying his method of investigating patients with irreversible organic brain lesions, the writer finds that in schizophrenia, also, there is impairment of abstract thinking. It is shown that many of the bizarre symptoms become intelligible when it is realized that these are reactions to the changed world of the schizophrenic, a world that is pathologically concrete and void of abstract interpretation. The level and kind of concreteness in schizophrenia is not identical with that of somatic cases, the schizophrenic world being richer and more animated with personalized ideas.

It is, as yet, not possible to say whether this impairment is a primary or secondary phenomenon. The similarity between the findings in organic and schizophrenic patients suggests that in the latter, also, a somatic factor is involved. S. M. COLEMAN.

Psychiatry and Morale.

The writer holds that, in total war, intensive psychological mobilization of the nation is of the utmost importance. Education for war requires that the individual's loyalty to country should be intensified and that his aggression should be directed towards the enemy. Enlarging on the above, the principles of war propaganda, as laid down in *Mein Kampf*, are reissued in psychological terminology. S. M. COLEMAN.

Mecholyl in Mental Disorders.

Forty-nine normal, psychoneurotic and psychotic male subjects were tested for cardiovascular response to the subcutaneous administration of acetyl-beta-methylcholine (mecholyl). It is suggested that the systolic pressure curves obtained may be a measure and function of autonomic compensation, low scores indicating deficient and high scores adequate or increased compensatory ability. S. M. COLEMAN.

Disorders in the Body Image.

The literature is reviewed and the complex structure of the body image, as it develops from early childhood, studied. The evidence is that distortion of the body-image can result, not only from organic changes, but also from essentially psychodynamic moments. The clinical material includes involutional psychosis of depressive and schizophrenic character, where the disorders of body-image are considered the "generating trouble." These are elaborated in the clinical picture in the form of delusions and hallucinations.

Depersonalization of the whole body or else of some organs may originate in psychogenic mechanisms; then it constitutes a result of partial withdrawal of libido. The problem of total or partial projection of body-image seems to include manifold implications. It ranges from the phenomenon of phantom through projection of non-injured parts of the body and ends in total projection of the entire body-image (autoscopy). S. M. COLEMAN.

APRIL.

Pathology Among Psychotics.

Autopsy material from 420 examinations among institutionalized psychotics is reviewed and the frequency of the pathological findings tabulated. Organic visceral changes were present in 96·3 per cent. of the cases. Demonstrable cerebral lesions occurred in 30·4 per cent. of the series of 324 brains examined.

This study demonstrates again the importance of toxemia, metabolic disturbance and oxygen deficiency as direct etiological agents in the problem of mental disease.

S. M. COLEMAN.

Significance of Body Image.

A technique of drawing the "body image" with the eyes closed is described and some 700 such drawings were examined. It is concluded that it is possible to determine from a "normal" population five distinctive types of elaboration and representation of the body image (with various sub-types arising from their several combinations). 250 individuals furnished the material for this appraisal. These five basic patterns into which the mass of drawing examples grouped themselves were found to agree fairly closely with specific patterns given by five groups among the psychoses, whose outstanding personality types had already been determined independently by psychiatric interview. These cases were of known diagnoses and ranged from mania to paranoia. S. M. COLEMAN.

Indian and Negro Blood in Manic Depressives.

On the basis of twelve cases it seems very probable that mixture with Indian blood toned down the symptoms of mania and depression. The manic states prevailed.

In mixed cases (Indian, white and negro) the manic symptoms, though intensified by the mixture with negro blood, were not influenced to such an extent that the typical manic state of the white race developed.

The symptoms of the depressive states were hardly influenced by the mixture with negro blood.

These observations agree with the finding that suicides are rare among the people of Panama. S. M. COLEMAN.

MAY.

Personality of Patients with Migraine.

The adult form of the Bell Adjustment Inventory was given to four male and twelve female patients who came to the Migraine Clinic at the Boston City Hospital.

Analysis of the material showed that the group was well adjusted to their homes; unsatisfactorily adjusted regarding health; showed slight social maladjustment, timid and retiring; was unsatisfactorily adjusted at the emotional level; well adjusted to their occupational environment.

It is concluded that the migraine patient tends to be similar to the psychoneurotic as far as personality make-up is concerned, and that one does not find any significant psychotic trends.

S. M. COLEMAN.

Peyote Intoxication.

Peyote, in its psychological aspects, is related to basic anxieties for survival, and furnishes a tie to nature with the promise of power to combat life's problems for the individual Indian user. It has been seen also that the physiological effects are such as to evoke anxiety which soon gives way to euphoria; here the personality of the individual user and the cultural orientation are factors. A potent influence in the religious use of the drug is the promise of power which is implicit in Father Peyote. This promise contains many psychological elements of a particular ethnic derivation. It is because of these traits introjected into the Peyote cult in its widest sense that Peyote carries the influence it does. In view of this it is apparent that the focus of attention could well be on the central emotional constellations in the Indian which allow Peyote to be invested with such omnipotent force by its adherents. This basic human function of projection of feelings to inanimate objects or institutions needs to be understood by any band of individuals interested in elevating the lot of the Indian, for the opportunity for the educational work among the Indians is in direct proportion to their receptivity. The removal of rationalizations, projections and evasions of real problems, physical and psychological, must occur before sounder beliefs can be inculcated. S. M. COLEMAN.

Ambulatory Insulin Shock Technique.

An ambulatory method of giving insulin shock therapy is described.

Forty-four patients with a definite diagnosis of schizophrenia were treated over a period ranging from one week to more than three years. Thirty-six patients (82 per cent.) showed definite clinical improvement, either slight or marked. Twenty-one patients (48 per cent.) showed a marked improvement or were considered recovered. Six out of 18 patients (33 per cent.) who had a psychosis of less than one year's duration were considered completely recovered.

S. M. COLEMAN.

VOL. XCVIII. JULY, 1943.

Convulsive Shock Therapy.

Traumatic skeletal and visceral complications are so serious from any form of straight convulsive shock that its use either with drug or electrical methods is contraindicated. The only safe preventive of traumatic complications for any type of convulsive shock is preliminary curarization. S. M. COLEMAN.

Pubertas Praecox in a Female Infant.

A case of macrogenitosomia praecox in a female infant is reported. The pathology found was a third ventricle cyst. Neighbourhood symptoms involved the epithalamus, thalamus, hypothalamus and adjacent structures. The pineal syndrome is most spectacular. The simultaneous involvement of the thalamic control, the hypothalamic disturbance of fat metabolism, the bilateral optic atrophy, the involvement of the pyramidal control and the hyperalgesia are all explainable on a basis of pressure. S. M. COLEMAN.

Cataplexy and Its Treatment.

Cataplexy is frequently associated with narcolepsy. Benzedrine in appropriate doses relieves most narcoleptics of symptoms, but has little or no influence on their cataplectic disorder. Potassium chloride in doses of 30 to 75 gr. daily by mouth succeeded in relieving all patients with severe cataplexy of their disabling symptoms but had no favourable influence on the narcoleptic disorder. S. M. COLEMAN.

Electric Shock Therapy and Epilepsy.

Electric shock and metrazol seizures have been compared in the same patient; certain differences are noted in the pre- and post-convulsive phenomena. Convulsions and post-convulsive behaviour follow the predetermined pattern of the individual, nor are these influenced by type of stimulus or previous medication. S. M. COLEMAN.

AUGUST.

Electric Shock in Psychoses.

Electro-cerebral shock causes mass cerebral and automatic nervous system irritation, the manifestations of which are profound effects upon the heart rate, blood pressure, pupils, state of muscular tonus, mental equilibrium, etc. Convulsive reactions are most desirable for treatment purposes, but *petit mal* reactions can be utilized in certain instances.

In a series of 100 cases, manic depressives and involutional melancholias responded best. Schizophrenias and mixed psychoses in which paranoid and delusional trends predominated did poorly. S. M. COLEMAN.

Environment and Heredity.

The writer reminds us that the struggle between the concepts of function and structure has been going on from times immemorial. The opinion of the investigator will be determined by the particular way he views what he thinks and feels are facts. Biologists tell us of the meaning of function in the development of structure. For more than a generation Jelliffe and White have been teaching that function precedes structure. Even organic pathologists have come to realize that diseases begin with functional changes which proceed, if not interfered with, to structural changes. The writer concludes that life is functioning and structure is organized function. S. M. COLEMAN.

Growth Concept of Nervous Integration.

The growth concept of nervous integration is introduced in outline form. It depends basically on two ideas: the parenchymatous nerve-cell acts as a tension-relaxation electrochemical battery; and the somatic cells, in their growth, act as the mechanism for charging the nerve-cell, through the blood-stream, by providing chemical substances for the building-up of potential energy (tension) and kinetic energy (relaxation). The tension-relaxation mechanism, thus created by the growth of the somatic organs, in turn dynamically restrains and models the function and architecture of the soma. A brain-organ equilibrium essential to life is thus brought about. S. M. COLEMAN.

SEPTEMBER.

Irritative (Camphor) Therapy.

A group of 70 chronically institutionalized male patients were segregated and subjected to camphor therapy. In the opinion of the writer the increased productivity and anxiety which follow this treatment should be made use of psychotherapeutically. S. M. COLEMAN.

Mental Symptoms in Multiple Sclerosis.

Twenty-eight patients with multiple sclerosis, of more than 10 years' duration, observed for six to eight months, were studied with special emphasis on their emotional affective symptomatology.

In general, there was found in this series of patients (1) a change in the emotional content or prevailing mood, most often in the direction of increased cheerfulness; (2) a marked sense of well-being out of proportion to their physical condition; (3) a tendency towards an increase of the affective expression, which at times was incongruous with the underlying mood.

S. M. COLEMAN.

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Post-motor Foci Influencing the Gastrointestinal Tract and Their Descending Pathways.

1. In acute experiments on dogs the gastrointestinal tract could be influenced not only from pre-motor area 6 but also from foci in a " post-motor " region (areas 5 or 3 respectively). Reactions of the gastrointestinal tract were obtained in some animals only from one of these areas (either the pre- or post-motor) ; in others this system could be influenced from both foci. Simultaneous records of stomach, small intestine and colon showed that the whole gastrointestinal tract may receive impulses from the pre- as well as the post-motor area. The effect may be synergic in all parts of the gastrointestinal system, or increase of activity in one part may be associated with inhibition in other parts of the gastrointestinal system. Sometimes, however, the effect is restricted to a limited part of this system.

2. In chronic experiments circumscribed lesions were placed in the post-motor area and the descending pathways traced by the Marchi method into the cerebral peduncle and the pyramidal tract. (Authors' abstr.)

APRIL.

Action of Metrazol on the Motor and Sensory Nuclei of the Brain Stem.

The action of local injections of metrazole on motor and sensory nuclei and on supranuclear centers in the brain stem of the decerebrate cat has been studied.

Metrazol has a direct excitant action on motor neurons, which leads to tonicoclonic contractions of the musculature that they innervate.

Metrazole also excites sensory neurons, the discharge of which leads to motor activity through reflex channels. In addition it induces a hyperesthesia characterized by an exaggerated response to peripheral afferent stimulation.

The application of metrazole to supranuclear mechanisms both induces motor behavior and greatly facilitates the responses of lower motor neurons to local metrazol.

These observations suggest that the metrazol convulsions which follow minimal intravenous doses are due to the summation of a great number of local stimuli, those from sensory and supranuclear mechanisms augmenting and facilitating the direct action of the drug on motor neurons. No evidence has been found for a general convulsant center. (Author's abstr.)

JULY.

The Influence of Electric Current Application on the Structure of the Brain of Dogs.

A careful gross and microscopic study of brains of dogs subjected to electronarcosis disclosed no pathologic alterations. The brains of the experimental animals did not differ anatomically from that of the normal control. There were no changes in the size, the consistency and the vascularization of the brain tissue, nor were there any alterations in the nature or number of the nerve cells. There were no changes in the glial elements nor in the structure, content and the environment of the blood vessels, and no abnormal accumulation of pigment or of fatty products of dissolution were found. It is significant that the histologic structure of the brain in the animal killed by electrocution did not differ from that in the other experimental and control animals.

The initial current used in most of the electronarcoses to which the experimental animals were subjected was of sufficient strength to have produced the characteristic symptoms of electroshock even when applied for only a fraction of a second. Instead, in each treatment, this current was continued for 30 seconds, and for several minutes in the cases in which the animal was killed by this method. It seems, therefore, that if electroshock were capable of producing undesirable effects on the structures of the brain, due to the current passage itself, these effects would have been more pronounced in the present experiments. However, no histological alterations were detected in the material under investigation. The absence of significant changes, therefore, indicates that with current of the strength used, the current passage itself is not an injurious factor. (Authors' abstr.)

Cerebral Patchy Demyelination; Case Report.

A case of cerebral patchy demyelination in a man, aged 56, presenting a clinical picture suggestive of a catatonic type of dementia praecon, is described. The anatomical studies revealed features typical of a primary demyelinating process, characterized by (*a*) sharp demarcation and limitation of the lesions to the white substance of the brain; (*b*) marked destruction of the myelin sheaths and breaking down of the axis cylinders; (*c*) relative integrity of the overlying cortex down to and including the arcuate bundles; (*d*) a reaction on the part of the astrocytes, microglia, and oligodendrocytes in the affected areas; and (*e*) lack of evidence of an inflammatory reaction. (Authors' abstr.)

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The Monkey (Macaca mulatta) *after Hemisection and Subsequent Transection of Spinal Cord.*

A series of 14 monkeys (*Macaca mulatta*) and one *Macacus mordax* have been studied after hemisection and subsequent transection of the spinal cord.

Reflex recovery was always more rapid in the previously paretic extremity.

Three animals developed crossed reflexes on the chronic side in response to stimulation on the acute side. Crossed flexion of digits was recorded a few hours after transection; crossed extension of the leg two or more days later.

Crossed inhibition may be more effectual when driven from the chronic side affecting the acute side than vice versa.

Only exceptionally is asymmetry reflected in internuncial potentials; never to the degree obtaining in the corresponding reflex responses.

The significance of the asymmetry observed is discussed in relation to spinal shock. (Authors' abstr.)

The Effect of Insulin Hypoglycemia on Conditioned Reflexes.

The chronic effect of insulin hypoglycemia on the central nervous system has been studied by means of conditioned reactions.

Normal rats which jump from a compartment A across a small partition to a compartment B in a response to an electric shock applied to the grid of the compartment (unconditioned response) are trained to react in a similar way in response to a conditioned stimulus (bell). This reaction is inhibited by lack of re-enforcement. Under such conditions no spontaneous recovery occurs, but insulin hypoglycemia restores the inhibited conditioned response. The action of insulin is cumulative and may lead to a permanent recovery. This effect of insulin depends upon the number of insulin administrations and the degree of hypoglycemia, coma being the most effective procedure. The reaction is specific, since no positive responses are elicited when stimuli are used to which the animal had not been conditioned previously.

The chronic effects of insulin coma are not restricted to disinhibition of conditioned responses, but influence also the excitatory processes which are the basis of conditioning. This is shown by the fact that a partial conditioning leading to an average of only 20 per cent. positive reponses in the control group causes 82 per cent. conditioned responses in the experimental group subjected to two insulin hypoglycemias during the training period. (Authors' abstr.)

Cortical Localization of Symbolic Processes in the Rat. II: Effect of Cortical Lesions upon Delayed Alternation in the Rat.

The experiment was designed to determine whether or not there are limited areas in the anterior cortex of the rat which subserve symbolic processes, and in particular recent memory, as has been found to be the case in primates.

In a T-maze in which rats spontaneously alternate, 17 rats were run for 60 trials each, pre- and post-operatively. Between each trial there was an interval of 15 seconds, and single alternation significantly greater than a chance level of 50 per cent. was taken as an index of the use of recent memory.

Following completion of post-operative tests brains were removed and the size and location of the lesions reconstructed upon standard diagrams. The majority of the lesions were in either the prefrontal or the occipital areas. Animals with the prefrontal lesions, except for one with a small lesion, lost their ability to use recent memory, whereas those with occipital lesions showed little difference in performance. Too few "pure" motor lesions were available to determine whether these also affected the recent memory. Parietal lesions, on the other hand, gave inconsistent results.

Some "localization" of recent memory in the anterior areas of the rat is definitely indicated, although more work is required to tell us how precise it may be. Considering the other cases of functional localization of specific functions established in recent years, the rat's cortex appears not to be so poorly differentiated as earlier maze studies led us to believe.

(Authors' abstr.)

Motor Response to Stimulation of Cerebral Cortex in Absence of Areas 4 and 6 (Macaca mulatta).

1. Stimulation of the cerebral cortices of *Macaca mulatta* from which areas 4 and 6 had previously been removed has revealed marked differences in excitability of the cortex from which the motor areas have been removed in infancy as compared to that from which motor areas have been removed later in life.

2. The cortex of the animal with motor areas removed in infancy has greater excitability in the regions surrounding areas 4 and 6, namely, the posterior lip of the central sulcus, areas 6b and 6a than has either the normal macaque cortex or that of the animal from which the motor areas have been removed at a later age.

3. Movements elicited from these regions are more diffuse, and require a higher threshold stimulus than do these regions in the intact hemisphere.

4. No regions other than those known to be excitable in the normal animal were found to be excitable in these preparations.

5. The changes in excitability in the animals operated on in infancy are consistent with the well developed motor performance of such animals during life.

6. They are consistent with functional reorganization within a partially destroyed motor system. There was no evidence of anatomical reorganization. (Authors' abstr.)

Sweat Gland Responses to Sympathetic Stimulation Studied by the Galvanic Skin Reflex Method.

1. Single induced shock applied to the sympathetic chain (L_2 and L_3) of cats caused a galvanic current to be given off by the large central pad of the hind foot. This response, which was monophasic, had an average latent period of 0·6 and a duration of 5 seconds.

2. The threshold for "make" currents was much higher than that for "break" currents. With larger currents the amplitude of the "make" response finally surpassed that for the "break."

3. Induced shocks at a rate of 136 to 375 per minute or 2 to 6 per second sufficed to obtain complete tetanization of the sweat glands, as indicated by the galvanic responses.

(Authors' abstr.)

Localization of the Salivatory Center in the Medulla of the Cat.

The lower brain stem of 35 cats has been stimulated with the aid of the Horsley-Clarke stereotaxic instrument. It was found that a copious salivary flow is easily elicited from the homolateral glands when the medulla is stimulated with a weak current.

Analysis of the responsive locations reveals that salivary secretion can be obtained by stimulation of the intramedullary visceral (oral) afferent system, such as the solitary fasciculus and its nucleus and certain portions of the spinal trigeminal nucleus and tract (mandibular division ?). On the efferent side, the distribution suggests that the salivatory nuclear masses might be either in the medial position caudal to the facial genu, or more likely, in the dorso-lateral region of the lateral reticular formation, dorso-medial to the spinal trigeminal nucleus, and dorsal to and at the level of the facial nucleus. In the latter case the efferent fibers must travel dorso-medially before they turn and make their exit in the ventro-lateral portion of the medulla. In any event, there is no sharp divison of the centers of the salivatory nerve fibers carried in the seventh and ninth cranial nerves. The rostral portion supplies the submaxillary glands, and the caudal portion the parotid. There exists an intermediate portion, stimulation of which yields both submaxillary and parotid secretion. (Author's abstr.)

Localization of Enzymes in Nerves. II: Respiratory Enzymes.

1. The distribution of cytochrome oxidase in nerve tissue of the squid has been studied. In the head ganglion the concentration is remarkably high, the QO_2 at 23° C. being −9·0 to −13·0. In the axoplasm extruded from the trunk containing the giant axon the concentration is lower, but relatively high compared with that of the remaining tissue. This finding is evidence for the previous assumption that the bulk of the respiratory enzymes is confined to the axoplasm, while in contrast practically all of the choline esterase is found at the neuronal surface.

2. Oxidation of pyruvic acid in the minced head ganglion occurs at a rate similar to that of p-phenylenediamine, the QO_2 being about −7·0 to −9·0. On the other hand, in a ground suspension of the head ganglion the activity of pyruvic oxidase falls off rapidly even if the following substances known to be of consequence in pyruvic acid oxidation are added: cytochrome c, adenosinetriphosphate, diphosphothiamin, diphosphopyridine nucleotide and succinate. In the axoplasm the activity of pyruvic oxidase was small, although in the whole trunk if minced, the rate of O_2 uptake is about the same with pyruvate as with p-phenylenediamine. The axoplasm dissolves rapidly in isotonic solution. Therefore the low QO_2 values must be attributed to the rapid loss of activity if the cell structure is destroyed.

3. Pyruvic dehydrogenation is strongly increased in the presence of diphosphothiamin. In view of the concentration of this coenzyme at the neuronal surface this incomplete breakdown, yielding acetic acid and carbon dioxide, may be of significance for the formation of acetylcholine. (Authors' abstr.)

Mechanism of Temporal Fusion. Effect of Photic Stimulation on Electrical Activity of Visual Structures.

The driving effect of intermittent photic stimulation on the electrical activity of the optic nerve, lateral geniculate body, tectum mesencephalon, optic radiations and cortex has been explored in monkey (*Macaca mulatta*).

(i) At an intensity of 10 fc., the optic nerve and lateral geniculate body could be driven at a maximum rate of 62 c.p.s. and 59 c.p.s. respectively, a rate that is well above the maximal critical fusion frequency for man and probably for monkey.

(ii) The cortex of the striate area could be driven at a maximum rate of 34 c.p.s.

(iii) While a driving effect could be obtained from the tectum mesencephali and from the optic radiations, it was not sufficiently stable to permit a determination of maximum rate.

(iv) The possibility is considered that our findings indicate a fusion mechanism in the cortex, which limits the temporal resolving power of the primate visual system. (Authors' abstr.)

JULY.

Temperature Effects on Reflexes of Isolated Spinal Cord. Heat Paralysis and Cold Paralysis.

1. In preparations of isolated spinal cord and legs from American frogs, spontaneous co-ordinated movements are observed if the temperature is between 3·5° and 21° C.

2. Differences are noted between American and Brazilian frogs in the form of reflexes, when the spinal medulla is subjected to different temperatures.

3. The time of resistance of spinal reflexes at different temperatures, in American frogs, as in frogs previously studied (Brazilian and European frogs), form curves with a maximum for a mean temperature. Below and above this temperature the time of resistance decreases.

4. Position and value of this maximum are dependent on habitual temperatures and conditions in which the frogs are living.

5. Reflex exhaustion is permanent when the spinal cord is subjected to temperatures between 14° and 29° C.

6. Above 29° C., before exhaustion, the spinal centres are paralysed after intervals of time decreasing with increasing temperatures. Recovery is obtained if the spinal medulla is put again in the mean temperature. Heat paralysis is not due to asphyxia, and recovery does not depend on any exchange between nervous centres and the outside atmosphere.

7. Below 14° C. cold paralysis is observed, and the time for it to be produced is shorter the lower is the acting temperature. Recovery also is obtained, after paralysis, when the medulla is placed again in the mean temperature. Cold paralysis, as heat paralysis, intervenes before the exhaustion of the centres.

8. Heat and cold paralysis are not due to an interruption of conduction in the nerve or to any action on peripheral organs. Under the action of low or high temperatures the nervous centres cease their functions long before peripheral nerves and organs.

9. The time of disappearance and the time of resistance of the reflexes after recovery from paralysis when the spinal cord is again at room temperatures may give available indications upon conditions of nervous centres at the moment when cold and heat paralysis are produced. At high and low temperatures, nervous centres are paralysed by concentrations of metabolic products, which are ineffective in mean temperatures. The intensity of action of these products is dependent on the temperature. (Author's abstr.)

Electroencephalogram of Decorticate Monkeys.

1. Electrical potentials have been recorded from cortex and subcortical nuclei in decorticate and hemidecorticate monkeys.

2. Simultaneous EEGs made from these areas may be independent of one another and the patterns from cortex, basal ganglia, thalamus and hypothalamus are characteristic for each specific area.

3. Each cellular complex, however, influences the other complexes. In particular lesions of the subcortical nuclear complexes affect cortical potentials.

4. The EEG obtained from basal ganglia of a hemidecorticate preparation shows low-voltage eight-per-second background potentials. Only when all of the cerebral cortex is removed do spontaneous bursts of high-voltage activity appear.

5. The pattern obtained from thalamus has a medium-rate component, as in the cortex. At times records of thalamus and post-central cortex are synchronous. Lesions of thalamus alter the pattern of cortical EEGs in general, but most markedly in the post-central areas.

6. There is little activity within the normal hypothalamus, but its ablation profoundly alters cortical EEGs.

7. Partial ablation of thalamus or hypothalamus temporarily alters cortical EEGs, but only when both thalamus and hypothalamus are completely extirpated are these cortical potentials abolished. (Author's abstr.)

Spontaneous Electrical Activity of Thalamus and Other Forebrain Structures.

1. The spontaneous activity of subcortical forebrain areas was recorded by means of bipolar electrodes oriented with a stereotactic instrument. Spontaneous bursts of 5–10 per second waves similar to those seen in the cortex were recorded in various thalamic areas, chiefly in those associated with the internal medullary lamina, but never in the "relay nuclei." These and other data suggest that several thalamic areas presumably giving rise to "non-specific cortical afferents" have a tendency to produce spontaneous rhythmic bursts, but that they may be under the additional control of a master area associated especially with the internal medullary lamina.

2. Characteristic spontaneous activity in other subcortical regions was recorded and is briefly noted. (Authors' abstr.)

Acute Physiological Effects of Gunshot and other Penetrating Wounds of the Brain.

1. Penetrating wounds of the brain were produced in dogs under morphine analgesia by means of a mechanical drill, pellet shot, 22 BB revolver and a 22 BB rifle.

2. A sudden, intense, increased intracranial tension of brief duration at the instant of injury was observed to accompany gunshot injuries of the brain by the 22 BB revolver and BB rifle. It is felt that this increased intracranial tension is the cause of the acute physiologic effects observed.

3. The results of the injuries could be classified into profound, moderate and minimal physiologic effects. Profound effects were characterized by loss of respiratory and palpebral reflex

activity, hypertension and death, the result of injury with the 22 short rifle (970 ft. per second). In the moderate group the reflexes and respiratory function were temporarily interrupted; a rise in blood pressure usually occurred; some of the animals survived. This degree of injury was produced by the 22 BB revolver (780 ft. per second). Those in the minimal group showed no significant change in the vital functions, and these animals all survived the acute experiment in which injury was produced by a penetrating drill or pellet shot. (Authors' abstr.)

Experimental Investigation of Visceral Afferent Synapses in Coeliac Ganglia.

1. The intestino-intestinal inhibitory reflex can be still obtained after any of the following procedures: bilateral vagotomy, bilateral splanchnicotomy, or bilateral abdominal sympathectomy.

2. So long as one splanchnic nerve or one lumbar sympathetic chain is left intact, the reflex persists.

3. Complete sympathectomy (removal of both sympathetic chains from above the stellate ganglion down to the level of the brim of the pelvis) abolishes the reflex.

4. Immediately after bilateral splanchnicotomy and bilateral lumbar sympathectomy the reflex can rarely be elicited. The procedure may leave some intact connections between the coeliac ganglia and the central nervous system. The possibility of preganglionic axon-reflexes has also to be considered.

5. No support is found for the postulated existence of true reflexes through the decentralized coeliac ganglia.

6. A vasopressor reflex following intestinal distension is still present after complete sympathectomy, but is markedly diminished by bilateral vagotomy below the diaphragm. Presumably the afferent pathway is largely vagal, but somatic nerves in the abdominal wall may participate to a lesser degree. (Authors' abstr.)

Pressure Block in Nerves Provided with Arterial Sleeves.

The strangling effect of sleeves of artery pulled over peripheral nerve on the underlying nerve fibers was investigated in limb nerves of the rat. Adrenalin applied to an arterial sleeve over a nerve produces rapid constriction and, as a result, progressive pressure block of conduction. The development of this block was studied oscillographically by stimulating the nerve proximal to the sleeve with "maximal" stimuli, and recording the decline of the action potential led off from distal levels during various phases of the constriction. Most or all of the fibers are blocked within 10 minutes after the application of the adrenalin. The block is reversible after washing, but conductivity returns only very slowly.

Sleeves pulled over nerves of much larger caliber and left for from one to two weeks produce pressure block with total or partial degeneration of the nerve fibers distal to the level of compression. The nerve proximal to the constriction is characterized by edema, resulting from the damming up of endoneural fluid, and by swelling of the axis cylinders. Degeneration within the compressed area itself is restrained, but becomes extensive at levels distal to the sleeve. Numerous fibers may persist throughout the compressed area in histological integrity in spite of chronic pressure block. Likewise, fiber regeneration occurs throughout the compressed area.

Sleeves of wide caliber, which have not affected the enclosed nerve during the period of transplantation, produce reversible pressure block upon application of adrenalin much as do freshly transplanted sleeves.

The bearing of these findings on the method of splicing severed nerves by arterial sleeves is discussed. (Authors' abstr.)

Note on Organization of the Tactile Sensory Area of Cerebral Cortex of Chimpanzee.

Although few, the observations here reported indicate that the tactile sensory area is organized in the same way in the chimpanzee as it is in the monkey. In the latter, analysis of the cortical pattern in terms of metameres showed that all spinal cord segments below C_8 are projected to the cerebral cortex in their spinal sequence, whereas the cervical segments on projection are reversed *en bloc*. This produces two regions of segmental discontinuity in the cortical sequence. These regions coincide with the boundary lines separating Dusser de Barenne's face, arm and leg areas. (Authors' abstr.)

Neuron Patterns Controlling Transmission of Ipsilateral Hind Limb Reflexes in Cat.

The reflex function within the hind limb of myelinated afferent fibers has been examined. Three sub-groups of these fibers are recognizable. The large fibers form direct connections with the motoneurons, the medium and small fibers connect with interneurons.

Reflex discharge mediated through the direct (two-neuron-arc) connections reflects only into the muscle, head of a muscle, or combination of muscles, the large afferent fibers of which are subjected to stimulation. Because of the identity of distribution holding for the two-neuron-arc discharge and the myotatic reflex, it is concluded that the two-neuron-arc pathways are reserved for mediation of the myotatic reflex.

Multineuron-arc discharges, evoked by stimulation of medium and small afferent fibers, are directed for the most part into the nerves of flexor muscles, and represent the flexor reflex proper. The minimum central pathway devoted to this reflex is one of three neurons.

Under appropriate conditions the flexor muscles receive excitation through arcs of two neurons as well as through the multineuron reflex arcs. The conditions are exactly those governing the transmission of two-neuron-arc excitation to extensor muscles. It is concluded that the flexor two-neuron-arc reflex represents the flexor tendon-jerk, or "pluck" reflex in contradistinction to the flexor reflex proper.

The segmental reflex discharge recorded from a ventral root on stimulation of the dorsal root of the same segment contains three major elements—an extensor two-neuron-arc, a flexor two-neuron-arc and flexor multineuron-arc discharges. Reflex activity through extensor two-neuron-arcs is inhibited, that through flexor two-neuron-arcs facilitated by the transmission of multi-neuron-arc reflex action. (Author's abstr.)

Conduction and Synaptic Transmission of Reflex Response to Stretch in Spinal Cats.

The afferent response to brief stretch of the gastrocnemius muscle is mediated by large (group 1) fibers at an average maximum velocity of 116 M per sec.

There is little if any true delay at the sensient organs responding to stretch.

The reflex response to brief stretch of the gastrocnemius muscle is transmitted through arcs of two neurons.

It was previously shown that the distribution of two-neuron-arc discharges accords with that of the myotatic reflex. For these several reasons it appears that the two-neuron-arc pathways are reserved for the mediation of myotatic reflexes.

The calculated overall minimum latency for the tendon jerk reflex of the gastrocnemius muscle is approximately 5·95 msec. (Author's abstr.)

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An Analysis of Shock Therapy in Schizophrenia on the Basis of a Nitrogen Inhalation Control Series.

1. In 62 cases of schizophrenia unsuccessfully treated with nitrogen inhalation there was a 52 per cent. improvement with insulin and metrazol therapies.

2. Utilizing the nitrogen anoxemia period as a control, it would seem that special attention, fear of death, satisfaction of the need to be punished, transient depression of brain metabolism, gross stimulation of the autonomic nervous system, unconsciousness, and subcortical motor phenomena are not influential in the therapeutic results of insulin and metrazol shock therapies.

3. It is suggested that further refinements of therapeutic measures be focused on improving methods for effecting the integration of consciousness with motility, preception and ideation.

(Authors' abstr.)

Observations on Electric Shock Treatment.

It seems probable that organic pathological changes are produced by the treatment. This view is supported by observation of physiopathological changes following electric shock. Most of these changes are reversible, as shown by electroencephalographic studies and clinical observation. It appears that electric shock is a severe stimulant to the vegetative nervous system. In at least two cases irreversible damage has been observed, while in another case transient signs suggestive of basal ganglia involvement were seen. In one of these cases trophic changes were prominent. Unfortunately, no pathological studies are available.

The similarity of electrically induced *grand mal* convulsions with those of epilepsy is stressed,

and there is speculation as to whether electric shock may create or modify an epileptic predisposition of the brain.

In the writer's experience a second series of convulsions usually will not result in the same degree of improvement as a first course of treatment.

It has been observed that most delayed convulsions are unusually severe.

(Author's abstr.)

Effects of Age on the Bellevue Intelligence Scales in Schizophrenic Patients.

1. The Bellevue Intelligence Scale tests were given to two groups of 20 and 30 schizophrenic patients with each group matched for sex, age and I.Q. to normal subjects. There was approximately 19 years' difference in age between the younger groups of 20 subjects each and the older groups of 30 each. It was, therefore, possible to compare the patients to their matched normals, and to study the younger patients in conjunction with the older patients with reference to traces of deterioration.

2. Although full I.Qs. are similar, the patients' verbal I.Qs. are higher on the whole than the performance I.Qs., while slight differences are found in favor of the performance I.Qs. for the normal subjects. These differences are not so exaggerated for the older population as is evident for the younger subjects.

3. For the younger group of subjects, the Digit Symbol test discriminates between the schizophrenic and the normal groups, occupying the lowest place in the former category, but contributing the highest score to the latter.

4. For the older subjects, the Digit Symbol test, the Object Assembly, and the Picture Arrangement tests are statistically significantly different as between the patient's and the normals' psychometric test results.

5. More subtests of the Bellevue Scale can detect with reliability the deterioration that shows itself in schizophrenia among the older patients, and these differ significantly from normals with respect to certain functions. (Author's abstr.)

Indications and Results of Electric Shock Therapy in Mental Disorders.

Seventy psychotic patients have been treated with electric shock; there were 56 schizophrenic patients; 9 belonged to the manic-depressive group and 5 suffered from involutional melancholia. A total of 1,333 electric shocks was administered. One patient suffered a fracture of the femur.

At the present time, two to ten months after completion of shock therapy, 30 per cent. of the schizophrenic patients are improved and 70 per cent. unimproved; of the 9 patients with manic-depressive psychosis, 6 recovered and 3 are unimproved; out of 5 involutional melancholia patients, only one did not improve. All four unimproved patients in the last two groups had some schizophrenic coloring in their psychoses.

Results reported by the author in 1940 in a group of 100 schizophrenic patients treated with metrazol were about the same—that is, 32 per cent. improved and 68 per cent. unimproved.

Electric shock therapy is preferable to metrazol because of less fear and apprehension, amnesia for the treatment and somewhat milder convulsive seizures.

Its greatest value is in the treatment of involutional melancholia, the manic-depressive psychosis and agitated depressions.

In schizophrenia, electric shock does not seem to produce permanent or lasting recovery; while amelioration of psychotic symptoms occurs in many patients, the essential schizophrenic pattern remains unchanged. Electric shock therapy may be utilized in preparing unco-operative, inaccessible, schizophrenic patients for other therapeutic measures, such as occupational and recreational therapy and psychotherapy.

The best results in schizophrenia are obtained in cases of short duration which do not show any deterioration. In the manic-depressive psychosis and involutional melancholia improvement results in spite of long duration of mental illness. (Author's abstr.)

JULY.

The Increase of Mental Disease.

The increase in mental disease presents a serious medical and social problem. It does not add to its significance, however, to exaggerate the rate of increase. Taking mental disorders

as a whole, there has been a slow upward trend over many years. The slope of the trend is not sufficiently steep to justify the alarmists, who ascribe the increase in mental disease to the rapid multiplication of defective stock. Society is becoming more and more complex, and each decade adds new and increasing stresses. As these stresses multiply, more individuals are incapable of sustaining them—individuals who under simpler circumstances might have maintained mental health. The problem of mental health is consequently a part of a larger program of maintaining a healthy social organism. Elements of this program must be social rather than medical, as, for example, in the control of the manufacture and use of alcoholic beverages, or in the guidance of pre-schizophrenic children. Other measures must await a better understanding of the degenerative diseases and of the physical changes accompanying senescence. As the science of geriatrics advances, one may look to the development of methods of preventing senile and arteriosclerotic mental disorders. (Author's abstr.)

Attempted Suicide: A Comparative Study of Psychopathic and General Hospital Patients.

1. Data in regard to 150 patients who attempted suicide prior to admission to the Syracuse Psychopathic Hospital were compared with the statistical findings in a similar group of 150 patients observed in two general hospitals with respect to whom the writers had previously reported.

2. While no general conclusions or theoretical considerations are offered, the following observations are of interest:

A strikingly higher percentage of patients was admitted to the Psychopathic Hospital because of suicidal attempts.

1. In regard to personality and diagnostic classification, while the degree of the psychic aberration was greater in those patients observed at the Psychopathic Hospital, marked personality deviations were found to occur in a large percentage of both groups. Psychoneuroses predominated in the general hospital group and functional psychoses in the mental hospital group.

2. The number of cases with organic illness comprised a little less than one-third of all the cases in each group. Lesions of the central nervous system were found more frequently in the Psychopathic Hospital series, while somatic disease was observed to occur more often in the general hospital patients.

3. Approximately three-fifths of the patients in each group were females.

4. Sixty per cent. of the suicidal patients observed in the Psychopathic Hospital were over 40 years of age, while more than 60 per cent. of the individuals studied in the general hospitals were under 40. Self-destructive attempts on the part of psychotic women observed at the Psychopathic Hospital occurred more often during the involutional period, while the psychoneurotic females found in the general hospitals were more prone to attempt suicide in the earlier decades of life. Male patients in both groups are more likely to commit suicide with advancing years.

5. Skilled workers were observed more often in the Psychopathic Hospital series, while unemployed persons or unskilled laborers were found to predominate in the general hospital series.

6. Members of the less common creeds or cults—hardly religious—were more frequently encountered in the Psychopathic Hospital series. Religious conflicts were more often elicited there.

7. In regard to methods employed, the history of patients admitted to the Psychopathic Hospital revealed a number of previous bizarre, partial or aborted attempts. Hanging, drowning and self-destructive endeavors involving injury by motor vehicles were not encountered in the general hospital patients, while these methods were employed by individuals at the Psychopathic Hospital. The general hospital patients inclined toward the use of phenol derivatives, iodine, illuminating gas, firearms and incisions with sharp instruments. The Psychopathic Hospital patients preferred to employ a combination of methods, or jumping from a height, or blunter instruments—generally more indecisive or indirect attempts.

8. Except for the presence of hallucinations and delusions of ill-defined fears and for the presence of a greater degree of anxiety in the Psychopathic Hospital patients, the apparent motives elicited from patients in both groups were similar. The underlying reasons given by the Psychopathic Hospital patients were more concealed. Because of the more bizarre nature of their apparent motives and actions, these patients gave more advance notice of their intentions.

Sexual maladjustment was given as a cause by slightly more than one-third of the patients of each group, while economic difficulties were mentioned by slightly less than 15 per cent. of either group. (Authors' abstr.)

OCTOBER.

Artificially Induced Fever as a Therapeutic Procedure.

1. Of 122 cases of general paresis treated by the methods described, there was some improvement noted in 67 per cent. There is an estimated remission-rate of 46·5 per cent. Of the patients treated, 15 per cent. are dead.

2. Of 17 cases of cerebral syphilis treated there was some improvement noted in 76 per cent. There is an estimated remission-rate of 53 per cent.; 12 per cent. of the patients treated have died.

3. When sulfa drugs fail, artificial fever offers a method of control in acute cases of gonorrhoea.

4. Patients suffering from pulmonary tuberculosis and general paresis have been treated by fever without any apparent harm to their chest conditions.

5. Considering any death occurring during treatment, or three months after the completion of treatment, as a treatment death, regardless of what the cause of death might be, there was a crude treatment death-rate of 6·6 per cent.

6. There were two deaths definitely associated with treatment, giving a mortality-rate of 1·6 per cent.

7. It is concluded that the optimum hours of fever in the treatment of general paresis are 70, with two-fifths of this period at a temperature of 106° F. or over.

8. Artificial fever is a comparatively safe procedure, but requires the supervision of trained personnel.

9. In those cases of general paresis having a history of convulsive seizures, phenobarbital has been used before and during artificial fever treatment. In all such cases treatment has been successfully concluded without complication. (Author's abstr.)

Experience with 3,057 Administrations of Curare to 232 Psychotic Patients Treated with Metrazol.

After using curare on approximately 3,000 occasions, it is concluded to be an excellent drug for preventing complications associated with metrazol therapy. Only occasionally patients are encountered who cannot tolerate the drug to an extent where it is useful. More rarely still is there an unpredictable reaction to the drug. The only difficulty encountered to date of this writing was the occasional occurrence of respiratory embarrassment, which in each incidence was readily and spectacularly controlled by intravenous administration of prostigmin.

Compressions of the vertebrae are even more unlikely to occur if the use of curare is supplemented by hyperextension of the spine.

Restraint of the patient during the convulsion is essential but should be limited.

The undesirable feature of fear associated with metrazol therapy may be largely overcome by proper attention to dosage.

Mild cases of diabetes are no contraindication to the use of metrazol.

In this series schizophrenics treated three times a week showed a higher recovery-rate than those treated twice a week.

No deaths have occurred with the use of these drugs to date at the Ontario Hospital.

(Author's abstr.)

PSYCHIATRY.

VOL. VI. MAY, 1943.

AUGUST.

PSYCHOANAL. QUART.

VOL. XI. 1943.

PSYCHOL. BULL.

VOL. XL. MAY, 1943.

JUNE.

JULY.

OCTOBER.

PSYCHOL. REC.

VOL. V. 1942.

PSYCHOL. REV.

VOL. L. MAY, 1943.

JULY.

SEPTEMBER.

NOVEMBER.

The Description of Personality. I: Foundations of Trait Measurement.

(1) All traits are really unique, but in a population with common racial and cultural backgrounds a majority are so nearly common that they can be treated as common traits, measurable on common axes.

(2) It is contended, with Gordon Allport, that " it is more important to discover intelligible traits than independent ones," i.e. mathematically independent ones, for the former have functional existence in the personality and society, and can be more widely used in prediction. Such intelligible unities seem to be of three kinds—dynamic, constitutional and social mould. Co-nascent and logical trait unities also have utility in special circumstances, but their present too facile and frequent use in education and guidance seems mistaken.

(3) These three kinds of traits manifest themselves as mathematical factors (not necessarily, or even probably, of an independent kind) in the factor analysis of trait element intercorrelations. To discover them, however, it will be necessary to collate a variety of static factor analyses with a well chosen variety of differential factor analyses, thereby evolving criteria for the rotation of axes distinct from the unpsychological methods—such as " simple structure "—now employed.

(4) Dynamic traits alone may be supplementarily investigated, both as unique and as common traits, by temporal sequence studies which are longitudinal, intra-individual methods.

(5) Clusters (of highly positively inter-correlating trait elements) are unlikely to be traits. Dynamic traits, one may deduce, are likely to manifest themselves as general factors with superimposed bi-polar factors. Constitutional traits will appear as simple general factors, probably with a more even saturation of behavior elements than is found for dynamic general factors. Social mould traits are likely to appear as much restricted group factors. Such considerations contribute towards, but do not provide a unique determination of trait unities by factor analysis. The possibility of a truly unique solution to a factor analysis, yielding the psychologically real trait unities in personality, is discussed in a later article.

(6) All traits, being relations between a changing organism and a changing environment, are only temporary patterns. The common traits, however, are likely to be at least as stable as a culture pattern.

(7) Common traits can be measured in either metric or normative (population relative) units; but unique traits, having to be defined by logical dimensions, can only be expressed in metric units. (Author's abstr.)

PSYCHOSOM. MED.

VOL. V. APRIL, 1943.

The Electroencephalogram in Psychopathic Personality.

Forty-four patients diagnosed psychopathic personality were studied electro-encephalographically. Of these, 23 (52 per cent.) were found to have EEGs which did not meet the criteria of " normal." (Authors' abstr.)

Changes in the Electroencephalogram during a Cycle of Morphine Addiction.

The assumption of a cortical excitatory state satisfactorily explains the action of repeated doses of morphine. Morphine acts to depress the cortical excitation, but this is not necessarily accompanied by a change in the level of alertness. Tolerance to the cortical depressing effect appears to be developed at quite different rates in different individuals. (Author's abstr.)

JULY.

OCTOBER.

On So-called War Neuroses.

" Nervous breakdown " due to war events differs from genuine neurosis. It is characteristic of a neurosis that at the center of the illness there is a personality change that hinders the individual from eliminating the escape mechanisms built up as a protection against danger and anxiety. The anxiety states observed in war are acute conditions of catastrophe that show the direct reactions to the situations of danger and that clear up if the latter is eliminated. Personality change need not necessarily develop. The situation is not essentially different in the cases of conversion states. Indeed, they are the more similar to neurosis by very reason of the fact that the patient develops more escape mechanisms for protection against danger and anxiety. But his personality need not change so deeply and permanently that the mechanism cannot be given up if they become useless, i.e. if the individual regains security. The symptoms then disappear. For the most part, therefore, no neurosis develops. This occurs only if the man remains in the situation of insecurity. Then the mechanisms become fixated and the personality undergoes change.

There are symptoms due to war events that have the characteristics of reactions to be observed in neurotics. They occur in the individual affected by special wartime conditions in principle in the same way and for the same biologic reasons as in neurotics. But they are not neuroses because there is usually no permanent personality change, and so no fixation of symptoms takes place. Personality change occurs only when causes are effective which maintain insecurity. Therefore we should not speak of war neuroses, but of anxiety states and conversional states due to war situations. It must be our endeavour to prevent the fixation of the protective mechanisms and the personality change, i.e. the development of real neuroses.

(Author's abstr.)

RORSCHACH RES. EXCH.

VOL. VII. 1943.

Recent Research on the Group Rorschach Test.

The author briefly reviews some of the problems raised by group Rorschach and some of the results obtained through its use. The outstanding technical problem is that of evaluating the effect of differences in method of administration. The important fact is not that of difference *per se*, but of difference in results obtained for varying conditions, subjects, and purposes. " What may appear as gross differences in method may actually be functional equivalents or near equivalents." The problems of slide production, time limits, trial blots, slide rotation, type of inquiry, and other variations in method must all be approached from this point of view. Results of several experimenters agree that in the group test percentages of W's, WM's and P's are greater, whereas D responses are less frequent. Recent experimentation has shown the utility of the group test for screening out convicts requiring psychiatric attention, for the selection of mechanical workers, and for the indication of changes in adjustment under high altitude conditions. E. M. L. BURCHARD (Psychol Abstr.).

JULY.

SPEECH MONOGR.

VOL. IX. 1942.

STUD. PSYCHOL. PSYCHIAT., CATHOL. U. AM.

VOL. V. 1942.

TR. AM. NEUROL. A.

VOL. LXVII. 1941.

VOL. LXVIII. 1942.

1. Biochemistry, Physiology and Pathology.

Acetylcholine and the Physiology of the Nervous System. Fulton, J. F., and Nachmansohn, D. [*Science*, **97**, 569–71 (1943).]
Discussion and review, with 18 references. E. D. WALTER (Chem. Abstr.).

The Action and Sphere of Usefulness of the Humoral Transmitter Acetylcholine. Hueber, E. F. [*Deut. med. Woch.*, **68**, 483 (1942).]
A review of the actions and clinical indications for acetylcholine (I), mecholyl and doryl on the basis of the literature and personal experience of the author. Slow infusion of (I) reduced the O_2 consumption of human subjects. Blood levels of Na, K and Cl remained unaltered. On the other hand, the excretion of K in the urine and the Na : K ratio were elevated. Adrenaline gave the reverse effects. A. GROLLMAN (Chem. Abstr.).

Significance of Acetylcholine as a Humoral Transmitter of Nerve Stimulation in the Central Nervous System. (I–III.) Utunomiya, Sansyo. [*Okayama Igakkai Zassi* (*Mitt. med. Ges. Okayama*), **53**, 823–40 (*in German*, 840) (1941).]
In order to determine whether acetylcholine (I) acts as a humoral transmitter of nerve stimulation in the central nervous system as in the peripheral nervous system, the effects of vagostigmin (II), an anticholine esterase, were studied on the pinna reflex upon sound stimulation in guinea-pigs, on the eyelid reflex upon electrical stimulation of the eyelid in guinea-pigs, on the pupil reflex upon light stimulation in pigeons, and on the deglutition reflex upon electrical stimulation of the central stump of N. laryngeus suppressed in rabbits. Each reflex was intensified and the reflex time was shortened by injection of (II). (II), however, did not influence the deglutition reflex when painted on the ganglion nodosum. This shows perhaps that (II) in the above reflexes acts chiefly on the synapse in the central nervous sytem. The tongue reflex time upon electrical stimulation of the central stump of N. glosso-pharyngeus in the frog is shortened by injection of small doses of (I) or (II), but is prolonged by injection of a large dose of (I).
RUTH BERGGREN (Chem. Abstr.).

Does Blood Contain Free Acetylcholine? Classen, Paul H. [*Z. ges. expil. Med.*, **109**, 688–95 (1941); *Chem. Zentr.*, **1**, 1153 (1942).]
Serum from fresh eserinized human blood did not contain free acetylcholine as shown in a test with the highly sensitive isolated lung of the frog. A control with 10^{-11} concentration of acetylcholine produced a response. In hemolyzed blood a substance was present causing contraction of the frog lung; that however was not acetylcholine, since the action was not influenced by cholinesterase or atropine. A. E. MEYER (Chem. Abstr.).

The Influence of Acetylcholine and Adrenaline on the Spinal Reflex. Oti, Yukio. [*Okayama Igakkai Zassi* (*Mitt. med. Ges. Okayama*), **52**, 2389–95 (*in German*, 2395) (1940).]
Acetylcholine and adrenaline inhibit the irritability of the spinal reflex in toads and frogs. Ergotamine also inhibits the irritability of the spinal reflex in toads, while ergotamine together with acetylcholine or adrenaline has the opposite effect.
RUTH BERGGREN (Chem. Abstr.).

The Effect of Acetylcholine and Adrenaline on the Spinal-reflex-increasing Action of Strychnine. Oti, Yukio. [*Okayama Igakkai Zassi* (*Mitt. med. Ges. Okayama*), **52**, 2591–7 (*in German*, 2597) (1940).]
In toads and frogs the increase in spinal reflex produced by strychnine was inhibited by acetylcholine and adrenaline. RUTH BERGGREN (Chem. Abstr.).

Sweat Response to Acetylcholine. Kahn, David, and Rothman, Stephen. [*J. Investigative Dermatol.*, **5**, 431–44 (1942).]
The local sweat response to intradermally injected acetylcholine (I) diminishes or disappears after sympathectomy. This is an exception to the rule of sensitization of structures after denervation (Cannon). The local sweat response to (I) is greater in men than in women.
PHILIP D. ADAMS (Chem. Abstr.).

The Colorimetric Determination of Choline. Marenzi, A. D., and Cardini, C. E. [*J. Biol. Chem.*, **147**, 363–70 (1943).]
The method is based on the oxidation of Cr to the chromic state by means of alkaline H_2O_2 (perhydrol), followed by the colorimetric determination of chromate by means of the color produced in acid solution with diphenylcarbazide (Cazeneuve's reaction). The method determines choline in samples of 1–3 ml. containing between 15–100γ.
EUGENE MAIER (Chem. Abstr.).

Inhibition of Cholinesterase and Pharmacological Action of Local Anesthesia. Ammon, I., and Zipf, K. [*Klin. Wochschr.*, **20**, 1176–7 (1941); *Chem. Zentr.*, **11**, 1146 (1942).]
Experiments *in vitro* showed that local anesthetics, as procaine (I), cocaine (II), larocaine (III), tutocaine (IV), percaine (V) and pantocaine (VI) distinctly inhibited cholinesterase. The

action was weakest with (I) and of about the same order with (II); it was 12·7, 15·6, 78 and 234 times greater with (III), (IV), (V) and (VI) respectively than with (I). The action of eserine was 14,000 times greater. There is a certain but by no means complete parallelism between the intensity of the cholinesterase inhibition and the local anesthetizing activity and also the general toxicity, effect in paralyzing respiration and hemolytic activity.

RUTH BERGGREN (Chem. Abstr.).

Cholinesterase I: Cholinesterase and Pseudo-cholinesterase. Mendel, B., and Rudney, H. [*Biochem. J.*, **37**, 59–63 (1943).]

Blood and certain tissues contain a non-specific cholinesterase which promotes the hydrolysis of various esters besides acetylcholine. In brain and in red blood cells of some mammals a specific cholinesterase is present which acts exclusively on choline esters. The non-specific cholinesterase exhibits maximum activity only in high concentrations of acetylcholine (300 mgm. per cent.), whereas the specific cholinesterase is inhibited by high acetylcholine concentration and has maximum activity in a low concentration (3 mgm. per cent.). The former is designated pseudo-cholinesterase.

S. MORGULIS (Chem. Abstr.).

Specificity of Cholinesterase. Riechert, W., and Schmid, E. [*Arch. exptl. Path. Pharmakol.*, **199**, 66–73 (1942); *cf. C.A.*, **37**, 3774[8].]

Cystine, ascorbic acid and fumaric acid inhibit the action of cholinesterase more or less. Methylene-blue, safranine, Nile blue and janus green have equal inhibiting actions on cholinesterase in leech extract, while in human serum methylene-blue has a stronger inhibiting action than the other three dyes. Physostigmine is the most powerful specific inhibitor of cholinesterase so far discovered.

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

Further Study of Cholinesterase. Riechert, W., and Schnarrenberger, C. [*Ibid.*, **200**, 225–34 (1942).]

The cholinesterase activity of aqueous leech extract does not decrease upon long standing exposure to air even though putrefactionsets in. The determination of cholinesterase activity is discussed. The medullary ganglions of the human brain have a greater cholinesterase activity than the higher regions of the brain. Procaine and tutocaine inhibit the activity of cholinesterase and their effect is not modified by addition of p-aminobenzoic acid. Sulfanilamide, sulfapyridine and sulfathiazole in therapeutic concentrations do not decrease cholinesterase activity.

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

Determination of the Choline-esterase Activity. Sack, A., and Zeller, E. A. [*Science*, **97**, 449–50 (1943).]

The serum, a $NaHCO_3$ solution and the acetylcholine solution were placed in the outer chamber of a Conway jar. A 0·1 N $Ba(OH)_2$ solution of 0·5 c.c. was taken out 40 minutes after the Conway jar was covered with the glass lid and the unreacted $Ba(OH)_2$ was titrated with 0·01 N AcOH.

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

Cholinesterase in Normal and Pathological Cerebrospinal Fluid in Man. Birkhauser, H. [*Schweiz. Arch. Neurol. Psychiat.*, **46**, 185–90 (1941); *cf. C.A.*, **37**, 2021[7].]

Cholinesterase was estimated by measuring the CO_2 liberated from AcOH obtained during hydrolysis of acetylcholine. The mean value for 23 normal cases was 14 c.mm. of CO_2 per 0·5 c.c. of cerebrospinal fluid per 120 minutes (mean deviation = 1·1). Cholinesterase was increased in meningococcal and tuberculous meningitis (not in correlation to increased cell content) and slightly also in schizophrenia.

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

Cholinesterase. Reichert, Willi, and Wieland, Theodor. [*Arch. exptl. Path. Pharmakol.*, **197**, 629–35 (1941); *Chem. Zentr.*, **1**, 3107 (1942).]

Cholinesterase splits acetylthiamine. Aqueous extract of leeches splits benzoylthiamine, 4-methyl-5-acetoxyethyl-N-methylthiazolium iodide and 4-methyl-5-acetoxyethyl-N-benzylthiazolium chloride at a considerably slower rate than it splits acetylthiamine. This action is inhibited by high concentrations of physostigmine.

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

A New Reaction for the Study of Globulin in the Cerebrospinal Fluid. Grigorescu. [*Wien. med. Wochschr.*, **92**, 144–5 (1942); *Chem. Zentr.*, **1**, 2807 (1942).]

Globulin can be detected by pouring a small amount of alcohol over the same amount of cerebrospinal fluid. This reaction gives an accurate picture of the meningeal state.

RUTH BERGGREN (Chem. Abstr.).

A Simple Method for the Determination of all Protein Fractions and of the Total Protein Content in Normal and Pathological Cerebrospinal Fluid. Ujsághy, Paul. [*Biochem. Z.*, **307**, 264–9 (1941).]

To 1 c.c. fluid (filtered or centrifuged) add 3 c.c. $(NH_4)_2SO_4$ solution (2 parts saturated neutral salt + 1 part 0·4 N HCl); mix and leave for 15 minutes. Determine the percentage of extinction in the photometer using filter S_{50} and 10 mm. depth. Read the protein content from a calibration curve. To another 2 c.c. sample add drop by drop 2 c.c. of a neutral saturated $(NH_4)_2SO_4$

solution and again read in the photometer, as before correcting for blank, and from the extinction value determine the total globulin + fibrinogen. The euglobulin + fibrinogen is determined on a separate 2 c.c. sample to which only 1·32 c.c. of the precipitating reagent is added. Finally, determine the fibrinogen content in a 2 c.c. sample by adding 1·08 c.c. of the neutral precipitating reagent. S. MORGULIS (Chem. Abstr.).

Rheumatoid Arthritis as a Cause of Increased Cerebrospinal Fluid Protein. Ludwig, Alfred O., Short, Charles L., and Bauer, Walter. [*New Engl. J. Med.*, **228**, 306–10 (1943).]

An increase in the total protein of the cerebrospinal fluid, abnormal colloid Au curves or a combination of the two were observed in 16 of 42 patients having spondylitis with or without peripheral arthritis. Of 59 with involvement of the peripheral joints alone, 9 showed these abnormalities. The changes in total protein or globulin contents may be caused by the increased permeability of the spinal cord membrane resulting from its proximity to inflamed articular tissue. E. R. MAIN (Chem. Abstr.).

The Importance of the Ascorbic Acid Content of the Cerebrospinal Fluid from the Standpoint of Differential Diagnosis. Wirth, Josef. [*Deut. med. Wochschr.*, **68**, 213–14 (1942); *Chem. Zentr.*, **1**, 2551 (1942).]

The determination of the ascorbic acid content of the cerebrospinal fluid after deproteinzation with Na_2WO_4–H_2SO_4 and alkalinization is of diagnostic significance. In encephalitis there is abundant protein and a strong reaction for ascorbic acid compared to the protein-free feeble reaction in the normal person. ARTHUR GROLLMAN (Chem Abstr.).

Quantitative Studies of the Bilirubin in Body Fluids. II: A Comparison of the Direct Diazo Reaction by the Photoelectric Colorimeter, the Three Test Tube Method, and the Oxidation Test in Xanthochromic Spinal Fluid. Lepehne, G. [*J. Lab. Clin. Med.*, **28**, 229 (1942).]

The xanthochromic spinal fluid was examined by the methods described in the first paper. The bilirubin in this fluid gives the same qualitative reactions as the bilirubin in serums of hemolytic jaundice, of jaundice of the newborn and of the non-hemolytic familial jaundice. The direct diazo reaction was delayed or biphasic delayed, and the oxidation test negative or diminished delayed. The total protein content did not influence the type of the reaction.
H. W. ROBINSON (Chem. Abstr.).

Glutamine-like Substance in Blood and Spinal Fluid. Harris, Meyer M. [*Science*, **97**, 382–3 (1943).]

Blood and spinal fluid of man or rabbit liberate NH_3 on mild acid hydrolysis. The amount liberated is equivalent to 5–10 mgm. of glutamine (I) per 100 c.c. of plasma, serum or spinal fluid. Insulin hypoglycemia and also the administration of glucose reduce the level of (I) in the blood, the effect of the former being more marked. The administration of certain amino-acids such as dl-*a*-alanine increased the level of (I) in the blood. Glycine produced no effect in some animals and a variable increase in others. W. J. P. (Chem. Abstr.).

Determination of the Isoelectric Point of the Proteins of the Cerebrospinal Fluid and Serum. Kastein, G. W. [*Klin. Wochschr.*, **20**, 1103–5 (1941); *Chem. Zentr.*, **11**, 931 (1942).]

A simple determination of the isoelectric point of proteins by means of a collargol solution and a series of buffer solutions of different pH values (modification of the HCl-collargol reaction of Riebeling-Huffmann (*C.A.*, **32**, 5488[8])) is described. A typical flocculation zone is obtained with normal cerebrospinal fluids, and more or less typical changes in the flocculation zone with pathological cerebrospinal fluids. With abnormal cerebrospinal fluids there are not only quantitative protein changes, but also qualitative changes in the protein components. An attempt was made to explain the reaction mechanism. The reaction can also be carried out with diluted serum, and can be of importance for the diagnosis of internal diseases (liver diseases).
RUTH BERGGREN (Chem. Abstr.).

Substitutes for Spinal Fluids as Colloidal Gold Controls. Bossak, H. N., Rosenberg, A. A., and Harris, Ad. [*Venereal Disease Inform.*, **24**, 194–6 (1943).]

Two methods are presented for preparing globulin solutions, utilizing jack bean meal and blood serums, respectively, which can be used as positive controls with which to guide the adjustment of colloidal Au solutions to a standard reactivity.
RUTH BERGGREN (Chem. Abstr.).

Clinical Experiences with a Modification of the Takata Reaction in Blood and Cerebrospinal Fluid. Ucko, H. [*J. Lab. Clin. Med.*, **28**, 17–27 (1942).]

The modified procedure of Ucko (*C.A.*, **30**, 7609[3]), which possesses a greater certainty in indicating affections of the liver, is described. The investigations by a number of workers on approximately 2,500 cases are summarized and discussed. A positive reaction for the test was obtained in 90 per cent. of the patients suffering from liver diseases, while at least 86 per cent. of the negative reactions were obtained in patients suffering from other diseases. Non-hepatic diseases with positive reactions are tabulated. As the test indicates an alteration of the serum proteins, the occurrence of positive reactions in non-hepatic diseases suggests that these alterations found

most regularly in liver diseases can occur in certain other conditions (multiple myeloma, tuberculosis, diabetes, malaria, etc.). The test applied to the cerebrospinal fluid is more sensitive than the routine tests for protein. From the results it can be concluded that the reaction is not specific for syphilis. HOWARD W. ROBINSON (Chem. Abstr.).

Changes in the Cerebrospinal Fluid Following Spinal Anesthesia. Konwaler, B. E. [*Am. J. Clin. Path.*, **13**, 378–80 (1943).]

The spinal fluid showed no significant changes in 31 patients one, two and three weeks after spinal anesthesia. The following tests were made: sugar, total protein, chlorides, cell count, colloidal Au, Takata-Ara, globulin and Kahn. JOHN T. MEYERS (Chem. Abstr.).

Pharmacodynamic Action of Vitamins in Nerve Disorders Due to Avitaminoses. Possibility of Non-specific Corrective Effects. Chauchard, B., Mazoué, H., and Chauchard, Paul. [*Compt. rend. soc. biol.*, **136**, 182–4 (1942).]

A discussion based on several previous papers. L. E. GILSON (Chem. Abstr.).

Vitamin Deficiencies and Liver Cirrhosis in Alcoholism. Introduction and Part I (Polyneuropathy). Jolliffe, Norman. [*Quart. J. Studies Alc.*, **1**, 517–57 (1940); *cf. C.A.*, **38**, 1664².]

After a detailed review, with bibliography, of literature to July, 1940, on "alcohol" polyneuropathy and its therapy by thiamine, Jolliffe concludes that the disease is caused not by alcohol *per se*, nor merely by the poor food habits of the alcoholic, but by a relative vitamin B_1 deficiency primarily due to unbalance between thiamine and caloric intakes, and further fostered by gastric and hepatic disorders interfering with food tolerance, absorption and assimilation, and also possibly by increased urinary thiamine excretion.

II. Circulatory Disturbances. [*Ibid.*, 727–38 (1941).]

Analysis of the literature on cardiovascular disturbances of alcoholism indicates that they are dependent upon thiamine deficiency, but does not yield a definite pathogenetic mechanism.

III. Pellagra. Jolliffe, Norman, and Stein, Martin H. [*Ibid.*, 739–50.]

"Alcoholic" pellagra results from deficiency of vitamin B complex, predominantly nicotinic acid, according to the investigations reviewed.

IV. The Wernicke Syndrome. Jolliffe, Norman, Wortis, Herman, and Stein, Martin H. [*Ibid.*, **2**, 73–85.]

From a review of the literature on Wernicke's syndrome (clouding of consciousness, varying ophthalmoplegias and ataxia, usually associated with alcoholism), it is concluded that this syndrome is probably a combination of several nutritional deficiencies affecting the nervous system. Alcohol *per se* does not seem responsible. Thiamine-HCl deficiency seems the most prominent etiologic factor, and thiamine-HCl administration is successful in reversing the ophthalmoplegia and frequently helps in altering the disturbed state of consciousness.

V. Nicotinic Acid Encephalopathy. [*Ibid.*, 85–92.]

The clinical and pathological symptoms of alcohol pellagra are discussed.

VI. Encephalopathies with Possible Nutritional Involvements. [*Ibid.*, 92–7.]

The authors believe that deficiencies of thiamine and nicotinic acid are not specific in causation of delirium tremens. However, they point out that delirium tremens, by raising metabolic requirements, may lead to production of nutritional disturbances of the nervous system, e.g. Wernicke's syndrome and peripheral neuropathy. Hence it is urged that all patients with delirium tremens be given thiamine and nicotinic acid as well as the entire vitamin B complex. In treatment of alcohol pellagra, it is recommended that riboflavin and other members of the B complex be given in addition to nicotinic acid in order to avert associated neuropathies. The role of thiamine in etiology and treatment of Korsakoff's psychosis is not yet clear.

MARION HORN PESKIN (Chem. Abstr.).

Thiamine Excretion Tests in Children with Paralytic Poliomyelitis. Ward, Robert, Sabin, Albert B., Najjar, Victor A., and Holt, L. Emmett (jun.). [*Proc. Soc. Exptl. Biol. Med.*, **52**, 5–7 (1943).]

The results of thiamine-excretion tests in seven children with paralytic poliomyelitis did not differ significantly from those found in normal children. L. E. GILSON (Chem. Abstr.).

Urinary Vitamin B_1 Content in Post-diphtheric Paresis. Reinhard, H., and Schwertzer, K. [*Arch. Kinderheilk.*, **118**, 192–5 (1939).]

Values were lower during the active paretic stage than during convalescence, but the latter was not hastened by administration of thiamine. B. C. P. A. (Chem. Abstr.).

Appetite, Vestibular Chronaxia and Action of Thiamine in the Beriberi Syndrome (in Pigeons). Mouriquand, G., and Coisnard, J. [*Compt. rend. soc. biol.*, **136**, 545–7 (1942).]

Pigeons on a diet deficient in the entire vitamin B complex showed a decrease in vestibular

chronaxie after 6 days, decrease in appetite in 8 days, anorexia in 12 days and paralytic spasms on the 17th day. When on a diet lacking in B_1 but containing the thermostable members of the B complex they developed the above symptoms on the 43rd, 55th, 60th and 80th day respectively. A single injection of thiamine effected a return to normal.

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

Balanced Partial Inanition and Vestibular Chronaxia. [*Ibid.*, 547–8.]

Pigeons on a balanced diet but with total food intake restricted to one-sixth of the normal lost weight and showed a decrease in vestibular chronaxia after 17 days.

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

Induced Thiamine (Vitamin B_1) Deficiency in Man. Relation of Depletion of Thiamine to Development of Biochemical Defect and of Polyneuropathy. Williams, Ray D., Mason, Harold L., Power, Marschelle H., and Wilder, Russell M. [*Arch. Intern. Med.*, **71**, 38–53 (1943); *cf. C.A.*, **36**, 4863[6]; **37**, 3481[7].]

Two human volunteers were restricted by diet to a thiamine (I) intake of 0·2 mgm./day (2,000 cal.) for 120 days. A test dose of 1·0 mgm. (I)-HCl was administered subcutaneously about every two weeks; this raises the average daily intake to 0·35 mgm. (I) (0·175 mgm. per 1,000 cal.). This "periodic partial cure" was attended by increase in appetite and activity 7–10 days after administration. Symptoms of (I) deficiency were manifested as early as the 30th day of restriction. The first objective evidence of abnormality in these subjects consisted of a decrease in their ordinary urinary excretion of (I). At about the 50th day the urinary excretion after a test dose of 1 mgm. (I) was reduced. After this time whenever dextrose was given, abnormally high values for pyruvic and lactic acids in the blood were observed. Also anorexia and weakness became more severe and paresthesia of the legs was observed. The earliest stages of (I) deficiency were demonstrated by determination of excretion after administration of a test dose of (I), more advanced stages by data on blood lactic and pyruvic acids, and still more advanced stages by progressively higher blood pyruvate curves after administration of dextrose.

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

Thiamine Inactivation by the Fresh-fish or Chastek-paralysis Factor. Sealock, Robert R., Livermore, Arthur H., and Evans, Charles A. [*J. Am. Chem. Soc.*, **65**, 935–40 (1943).]

The Chastek-paralysis or thiamine-destroying activity of fish tissues has been investigated by means of methods *in vitro*. the thiamine (I) loss being measured by a standard colorimetric chemical procedure. The fish pulp or extract (1–3 ml.) adjusted to pH 7·4 is treated with 0·2 M phosphate buffer (pH 7·4), the volume adjusted to 4 ml. with H_2O and 1 ml. of (I) solution (2·5 micromoles) added; after incubating for two hours at 37·5°, 5 ml. of 20 per cent. Cl_3CCO_2H is added, the solution allowed to stand for 30 minutes, centrifuged and analysed for (I). One unit of activity is that amount which, under the above conditions, will cause the disappearance of 1 micromole of (I). By this method it has been shown that the (I)-destroying principle is present in the majority of the visceral tissues of the carp, and that the spleen, liver and pancreas, gastrointestine and gills contain the highest concentration. A dry stable powder can be prepared from the active fish tissues by acetone treatment. The solubility of the factor in diluted salt solutions, the rapid destruction by heat and the precipitability by common protein precipitants indicate the fish principle to be of protein nature. The destruction of (I) is maximum at pH 9·1 and 60°, is proportional to the amount of principle and is characterized by 1st-order velocity constituencies. These facts, together with the evidence of the catalytic nature of the reaction, strongly suggest that the principle effecting the (I) loss is an enzyme.

C. J. WEST (Chem. Abstr.).

Muscle and Nerve in Biotin-deficient Rats. Lazere, B., Thomson, J. D., and Hines, H. M. [*Proc. Soc. Exptl. Biol. Med.*, **53**, 81–2 (1943).]

At no stage of biotin deficiency was the capacity of a motor nerve to elicit tension in its muscle impaired. A decrease in the strength of skeletal muscle occurred only in the terminal stages. The rate of neuromuscular regeneration after crush injury of nerves was not significantly different from the normal.

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

Vitamin D and the Functioning of the Nervous System. Chauchard, Paul. [*Compt. rend. soc. Biol.*, **136**, 51–5 (1942); *cf. C.A.*, **36**, 2594[8], 3533[4].]

Oil solutions of vitamin D were injected intraperitoneally in guinea-pigs not in a state of avitaminosis. Chronaximetric analysis showed that small doses excite the central nervous system, while large doses have an inhibiting action because of their hypercalcemic effect.

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

Observations on Pellagra. Frontali, G. [*Schweiz. med. Wochschr.*, **72**, 208–17 (1942).]

Twelve children were given a pellagragenic diet, yielding 2,150 calories and having a protein content which was 13·4 per cent. of total calorie. After two months typical cutaneous and mucous membrane changes occurred. The skin capillaries were markedly dilated and tortuous. Within 48–72 hours after therapy with nicotinic acid these alterations disappeared. Gastric hypochlorhydria was observed in 8 children and a negative N balance with loss of weight in 8

cases. The blood porphyrin was increased up to 10·5γ per cent. By the method of Baserga and Fornaroli (*C.A.*, **38**, 5515[8]), determinations of nictotinic acid excretion in the urine gave values of 0·5 to 0·7 mgm. per day, the normal being 3·5 mgm.

MAURICE M. RATH (Chem. Abstr.).

Symptomatology of Experimental Pellagra. Efremov, V. V., and Maslenikova, E. M. [*Voprosy Pitaniya*, **10**, *No.* 2, 70–4 (1941); *Chem. Zentr.*, **1**, 1769 (1942); *cf. C.A.*, **38**, 2594[8].]

Substitution of starch for sucrose in Sherman's basic diet with the addition of B_1 results in the following lesions in rats: erythroedema of the extremities, necrotic lesions of the tongue and rhinitis.

ARTHUR GROLLMAN (Chem. Abstr.).

Stability of Nicotinic Acid and Its Urinary Excretion. Ghosh, N. C. [*Ann. Biochem. Exptl. Med.*, **1**, 235–8 (1941).]

Nicotinic acid (I) in diluted aqueous solution at pH 3 to 5 disappears rapidly at room temperature owing to bacterial destruction. At lower or higher pH values it is quite stable, pH 8·5 being optimum. NaCl does not prevent its destruction, but EtOH, toluene or steam-pressure sterilization confer complete stability. From 3 to 3·5 mgm. of (I) were excreted in the urine per 24 hours by each of eight healthy male adult Bengali, while two 5-year-old boys excreted daily from 1·4 to 2·7 mgm. Urine when preserved with toluene and kept in a refrigerator retained its (I) content for one month. If appreciable quantities of coal gas were present in the laboratory air, erroneously high (I) values were obtained, due to pyridine contamination.

BRUNO VASSEL (Chem. Abstr.).

Determinations of Nicotinic Acid in Blood and Urine. Roggen, J. C. [*Nederland. Tijdschr. Geneeskunde*, **85**, 4603–8 (1941); *Chem. Zentr.*, **1**, 1917 (1942).]

By adsorption on frankonite-KCl and by use of a very strong acid it was possible, in the color reaction of König, to obtain a completely clear solution and a very strong, yellow color which was sufficiently stable in daylight, by means of the following procedure: 2 c.c. of Br_2 is dissolved in 75 c.c. of water. While cautiously shaking under a hood, 20 c.c. of a 10 per cent. NaCN is added to this Br_2 solution until a trace of free Br_2 is still present as tested with KI paper. The solution is now colorless or very slightly green with a pH of 5. To this solution is added 28 c.c. of an acetate buffer obtained from 20 c.c. of 0·4 N AcOH (20 gm. of glacial AcOH per l.) plus 8 c.c. of a solution of 50 gm. of crystallized AcONa per l. After mixing, the solution is filtered to remove very small amounts of resins. The solution keeps indefinitely in the icebox in the dark. Detailed descriptions for determinations in blood and urine are given which show reproducible results. In an average of 117 determinations in the blood of various persons of different age, sex and living conditions, a nicotinic acid content of 6·25γ per c.c. is found with a standard deviation of 1·05γ. The accuracy of the determination is 5 to 10 per cent. The total nicotinic acid is contained in the red blood cells, none of it in the serum. In the urine the results vary considerably.

R. BEUTNER (Chem. Abstr.).

Test for Nicotinic Acid Amide in the Urine. Wenusch, Adolf. [*Oesterr. Chem.-Ztg.*, **45**, 87–8 (1942); *Chem. Zentr.*, **11**, 554 (1942).]

An extract of 1 c.c. was prepared from 2,000 c.c. urine. This extract should have contained all the nicotinic acid in the urine. The extract gave a very marked reaction with BrCN and aniline, but did not yield nicotinic acid picrolonate with picrolonic acid. This urine, therefore, contained no nicotinic acid, but did contain a substance which, like nicotinic acid, gave a color reaction with BrCN and aniline.

RUTH BERGGREN (Chem. Abstr.).

Blood Level and the Requirement of Nicotinic Acid in Newborn Infants. Verrotti, Irene. [*Pediatria* (*Riv.*), **50**, 20–34 (1942); *Chem. Zentr.*, **1**, 3223 (1942).]

In newborn infants the content of nicotinic acid in urine and blood is lower than during the period of suckling. At the age of two it reaches normal adult values. The daily requirement of a suckling fed exclusively on mother's milk, as ascertained from the daily secretion in urine, is 120 to 140γ/kgm. body-weight.

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

Niacin-niacinamide Differentiation in the Microbiological Assay Procedure. Atkin, Lawrence, Schultz, Alfred S., Williams, Wm. L., and Frey, Charles N. [*Am. Chem. Soc.*, **65**, 992 (1943).]

The microbiological niacin (I) assay method of Snell and Wright (*C.A.*, **35**, 4792[4]) does not differentiate between (I) and niacinamide (II). This may be done by the action of Br and KOH, which transforms (II) into β-aminipyridine; the proportion of (I) to (II) in a preparation can be determined by estimation of the vitamin activity before and after treatment with Br and KOH. (II) (1 mgm.) in 6 ml. H_2O, 1 ml. saturated Br-H_2O and 3 ml. 30 per cent. KOH are kept 20 minutes at room temperature and then heated on a steam bath for 20 minutes; after acidification with 10 N H_2SO_4 the Br is removed with 4 per cent. $NaHSO_3$.

C. J. WEST (Chem. Abstr.).

Electroencephalographic Study of 275 Candidates for Military Service. Harty, J. E., Gibbs, E. L., and Gibbs, F. A. [*War Med., Chicago*, **2**, 923–30 (1942).]

The incidence of abnormal EEGs in the total group was 30 per cent. For various reasons it is believed that this percentage is higher than in the general population. A superior control

group (hospital staff) gave 15 per cent. abnormal tracings. The percentages of abnormal tracings in the candidate group were respectively 46 and 13 for men with and for those without a history of severe head injury or neuropsychiatric disorder. Epileptoid types of abnormality were five times more common for men with than for men without a positive neuropsychiatric history. The practical value of an EEG in military selection is that it focuses attention on certain persons and marks them for special neuropsychiatric scrutiny, particularly when a general examination indicates that a draftee is on the borderline between acceptable and rejectable. M. E. MORSE (Psychol. Abstr.).

The Metabolism of Pyruvic Acid in Brain. Simola, P. E., and Alapeuso, H. [*Z. physiol. Chem.*, **278**, 57–91 (1943); *cf. C.A.*, **34**, 1394.][2]

Beef brain is minced and incubated in Ringer-phosphate solution or in 0·025 N $NaHCO_3$ in the presence of O or N and 0·01 N Na pyruvate for two hours at 37°. During this period 20–31 per cent. of the added pyruvate disappears in N, 22–36 per cent. in O. Of the amount lost, approximately 23 per cent. is converted to lactic acid under aerobic, 42 per cent. under anaerobic conditions. Both in O or N, 0–3 per cent. is converted to succinic, 13–25 per cent. to -ketoglutaric, 0–2 per cent. to fumaric acid; malic and oxalacetic acids are not formed. Citric acid is not formed in N, while 2–4 per cent. are formed in O. In the presence of both pyruvic and malic acids in O, a little more citric acid is formed than the sum of the amounts formed from either of the substrates alone. AcOH is produced in minimal amounts in N (in presence or absence of methylene blue) and in O; these amounts seem to be produced in brain even in absence of pyruvate. Brain contains small amounts of HCOOH, which are not increased by addition of pyruvate. About 16–18 per cent. of the disappearing pyruvic acid can be accounted for as alanine both in O and N. Brain contains approximately 60 mgm. per cent. of glutamic acid; this amount can decrease slightly on addition of pyruvate. Methods for the determination of the possible products of pyruvic acid metabolism are described.

B. J. JANDORF (Chem. Abstr.).

The Mineral Metabolism in Acute Psychoses. Lenz, H. [*Klin. Wochschr.*, **20**, 785–7 (1941); *Chem. Zentr.*, **2**, 1258 (1942).]

The K content of the cerebrospinal fluid was decreased and the Cl content increased, while the Na content showed no essential changes. The serum values were normal in all cases. Possible causes for these changes and their significance for the knowledge of psychoses are discussed.

RUTH BERGGREN (Chem. Abstr.).

Urinary Elimination of Phenolsulfonephthalein Injected into the Cerebrospinal Cavity in Schizophrenia and General Paresis. Androp, S., Ratcliffe, H. E., and Katzenelbogen, S. [*Am. J. Med. Sci.*, **206**, 86–9 (1943).]

By the use of the test devised by W. E. Dandy (*J. Am. Med. Assoc.*, **61**, 2216 (1913)) the total elimination of the dye was found to be distinctly below the normal level. The results suggest the need for well-established normal levels. RACHEL BROWN (Chem. Abstr.).

The Isolation of 'Protective Enzymes in Schizophrenic Patients during Insulin Treatment. Buschhaus, O. [*Allgem. Z. Psychiat.*, **119**, 143–59 (1941).]

Highly active enzyme preparations were isolated from the urine of seven schizophrenic patients during insulin treatment. With the micro method of the Abderhalden reaction the Me_2CO-urine precipitate exhibited, in addition to the hydrolysis of organ substrates, an especially marked decomposition of insulin. While active proteinases which hydrolyzed brain substrate could be isolated from the urine, the enzyme which hydrolyzed insulin could not be satisfactorily prepared in a highly active form. Besides the enzymes which hydrolyzed cerebral cortex, enzymes which produced a particularly marked hydrolysis of testis, anterior pituitary and thyroid could be isolated. Characteristic albumin crystals in the form of short rods could be obtained which corresponded morphologically to the crystals described by Mall (*cf. C.A.*, **35**, 7426[1] and following abstract). The enzyme reactions observed in schizophrenic patients are distinguished, particularly by the hydrolysis of brain substrate, to a considerable degree from the enzyme reactions observed in other diseases and in normal persons. Comparison of the patients studied with and without insulin showed that under insulin there was no essential intensification or diminution of the protective enzyme reactions corresponding to the schizophrenic basic process, especially with regard to the hydrolysis of cerebral cortex and testis.

RUTH BERGGREN (Chem. Abstr.).

The Lipides of the Human Spinal Cord. Schuwirth, K. [*Z. physiol. Chem.*, **278**, 1–6 (1943); *cf. C.A.*, **38**, 1809[6].]

The human spinal cord contains approximateiy 75 per cent. H_2O. The lipide content, in terms of gm. per 100 gm. dry weight, is: Fat and cholesterol 15–20, Et_2O-soluble glycerophosphatides 19–29, sphingomyelins 2·6–2·8, cerebrosides 5·1–6·2, gangliosides 0·0–0·3. Spinal cord, in contrast to brain, contains only small amounts of highly unsaturated fat acids. From the cerebrosides, cerebronic, lignoceric, nervonic and hydroxynervonic acids, sphingosine and galactose can be isolated, from the sphingomyelins, lignoceric and stearic acids.

B. J. JANDORF (Chem. Abstr.).

Acid-soluble P Compounds of Cerebral Tissue. *Stone, W. E.* [*J. Biol. Chem.*, **149**, 29–41 (1943); *cf. C.A.*, **34**, 6683³.]

Approximately 1 : 10 extracts of dog cerebral tissue frozen *in situ* were prepared with 5 per cent. CCl_3COOH. Neutralization with $Ca(OH)_2$ and treatment with 10 per cent. EtOH gave a precipitate of inorganic P (I) and a large proportion of the adenosine triphosphate (II). After the further removal of (I) and (II) by precipitation with excess $Ca(OH)_2$, residual organic P (III), phosphocreatine (IV) and pentose (V) were precipitated by the addition of 80 per cent. of EtOH to the neutralized solution. (III) consists largely of hexose 6-monophosphate. The uranyl precipitate of (III) extracted with $Ba(OH)_2$ consists largely of aminoethyl phosphate. No phosphoglyceric acid could be detected in cerebral tissue. Triose phosphate and phosphopyruvate were not detected in the fraction precipitated with 80 per cent. EtOH. In the fraction precipitated by $Ca(OH)_2$ the ribose monophosphate P equals half the acid-hydrolyzable P. The principal changes occurring during 30 minutes of post-mortem autolysis of cerebral tissue are the hydrolysis of (IV) and the partial decomposition of (II). The methods used indicate the presence of adenosine diphosphate, adenylic acid, a nucleoside or free pentose and inorganic phosphate among the decomposition products of (II). RACHEL BROWN (Chem. Abstr.).

Metabolic Basis for Stabilization of Resting (Nerve) Potentials by Calcium. *Shanes, A. M.* [*J. Cellular Comp. Physiol.*, **19**, 249–52 (1942).]

Presence of 0·013 M Ca maintains resting potential in frog sciatic nerve in spite of anoxia or iodoacetate. Addition of Ca to a nerve already poisoned by iodoacetate has no effect until pyruvate is added, when p.d. is restored (*cf. C.A.*, **36**, 2628⁴). B.C.P.A. (Chem. Abstr.).

Effect of Striated Muscle Paralysis Induced with Erythroidine on the Electroencephalogram. *Girden, E.* [*Proc. Soc. Exptl. Biol. Med.*, **53**, 163–4 (1943).]

So long as proper artificial respiration is given, normal cortical activity, as indicated by the electroencephalogram, persists undisturbed in dogs and monkeys during complete paralysis induced with erythroidine. L. E. GILSON (Chem. Abstr.).

Serine as a N-containing Constituent of the Glycero-phosphatides of the Human Brain. *Schuwirth, K.* [*Z. Physiol. Chem.*, **277**, 87–96 (1942); *cf. C.A.*, **37**, 922⁹.]

Human brain was treated with Me_2CO, extracted with Et_2O and the solution precipitated with Me_2CO. Hydrolysis with 5 per cent. 2N NaOH in EtOH for 6 hours and with 10 per cent. HCl in H_2O for 3 hours gave identical values in the hydrolyzate for choline, amino and colamine N. Since the colamine N accounts only for about 50 per cent. of the total amino N, the presence of an undetermined amino acid was postulated. The glycerophosphatide was hydrolyzed with $Ba(OH)_2$, filtered, freed from Ba with H_2SO_4 and concentrated *in vacuo*. Most of the choline was removed with EtOH. Serine was isolated in the form of its compound with β-naphthalenesulfonic acid, m. 214–18°. From the hydrolyzate a small quantity of serine was obtained directly after extraction with BuOH and PrOH in succession, and keeping the mother liquid in the cold. A. E. MEYER (Chem. Abstr.).

The Glycogen Contents of Various Parts of the Central Nervous System of Dogs and Cats at Different Ages. *Chesler, A., and Himwich, H. E.* [*Arch. Biochem.*, **2**, 175–81 (1943).]

Glycogen increases progressively with age in the cortex and the caudate nucleus but decreases in the colliculi, cerebellum, medulla oblongata and cord in both dogs and cats. It increases in the thalamus in the dog, but decreases in the cat. VERNON L. FRAMPTON (Chem. Abstr.).

Respiration of the Brain in vivo. (1) *Lactic Acid Formation.* *Johgbloed, J.* [*Arch. neerland. physiol.*, **25**, 548–52 (1941); *Chem. Zentr.*, **2**, 681–2 (1942).]

The lactic acid (I) content was determined in the brain and liver of rats which had been kept under a pressure of 265 mm. Hg. for 0–120 minutes with constant removal of the CO_2 formed. During the first 15 minutes the (I) content in the brain increased markedly and then remained at this high level, while in the liver the behaviour was almost the opposite. It is assumed that in O deficiency the organs of most vital importance increase their (I) formation from sugars in order to gain energy, while the (I) formation decreases transitorily in the others.

RUTH BERGGREN (Chem. Abstr.).

Localization of the Two Isodynamic Phosphatases in the Central Nervous System. *Carandante, G.* [*Arch. sci. biol.* (*Italy*), **28**, 13–21 (1942); *Chem. Zentr.*, **2**, 788 (1942).]

In beef brain, free of blood, the amount of acid phosphatase extractable by physiological NaCl solution from equal weights of the different parts decreased in the order, medulla, cortex, cerebellum, white matter, while the alkali phosphatase decreased in the order, medulla, cerebellum, cortex, white matter. The ratio of acid phosphatase to alkali phosphatase was 0·78 for medulla and 2·2 for white matter. L. E. GILSON (Chem. Abstr.).

The Nature of the Nerve Influence on Retinomotor Phenomena. (*The Action of Eserine, Acetylcholine, Adrenaline, Atropine and Nicotine on the Light and Dark Migration of the Rods and Cones.*) *Studnitz, C. v., and Kosarov, G.* [*Z. vergleich. Physiol.*, **29**, 418–32 (1942).]

The position of the rods and cones was determined in the retinae of frogs treated with physostigmine, acetylcholine, atropine, nicotine or adrenaline (injection into the dorsal lymphatic

sac); the frogs had been previously dark-adapted and exposed to light shortly after the injection or they had been light-adapted and then placed in the dark. The values were compared with those of control animals similarly treated except for injections only of 0·65 per cent. NaCl solution of the same pH as the above solutions. Acetylcholine was the only substance studied which exerted an antagonistic action on the rods and cones in which, in the sense of the light stimulus, it caused contraction of the cones at both concentrations used (10^{-4} and 10^{-8}) upon light and dark exposure, but produced only expansion of the rods. Effects of light on the migration of the visual elements could therefore be due to an excretion of acetylcholine resulting from illumination of their nerve-endings. The discussion of the possibilities of a promoting action of the same nerves also upon dark exposure leads to the assumption that this must be due to a second substance excreted under these conditions of adaptation by the same nerve-endings, likewise antagonistic to the inner members of the visual cells, but in opposite directions like acetylcholine. The dissimilar effect of atropine and nicotine which caused expansion of the rods and cones upon light and dark exposure on the part of the second "promoting hormone" is pointed out; the neurohormone active upon light exposure inhibits the activity of atropine, and promotes that of nicotine on the inner members of the visual cells, while the one which favors the migration on dark exposure conversely promotes the influence of atropine and inhibits that of nicotine. Possibly the activity of eserine on the inner members of the visual cells is similarly influenced by the two neurohormones. A contracting action of physostigmine, at least on the cones, is evident. Under the supposition of chemical transmission of stimulus another pair of active substances must be assumed for the inhibition of the retinomotor phenomena, in which adrenaline at best could play only a partial role. Its behaviour differed according to concentration and adaptation, but was always in the same sense on the rods and cones; it always caused contraction on light exposure (concentrations of 10^{-4} and 10^{-8}), while on dark exposure it always produced distinct expansion at a low concentration (10^{-7}) and slight contraction at a higher concentration (10^{-4}). RUTH BERGGREN (Chem. Abstr.).

Probable Mechanism by which Somatic Changes in Certain Emotional States are Mediated. Milhorat, A. T., Small, S. M., Doty, E. J., and Bartels, W. E. [*Proc. Soc. Exptl. Biol. Med.*, **53**, 23–5 (1943).]

Preliminary experiments show that the blood of mentally ill patients showing fear or anxiety contains a substance which changes the rhythm of contractions of isolated rabbit intestine. L. E. GILSON (Chem. Abstr.).

The Isolation of Protective Enzymes in Schizophrenic Patients. Wagner, H. [*Allgem. Z. Psychiat.*, **119**, 124–42 (1941).]

Enzymes were isolated by the procedure of Mall (*C.A.*, **35**, 7426[1]) from the urines of 5 schizophrenic patients. All 5 cases yielded enzymes which hydrolyzed markedly the cerebral cortex and testis. Occasionally, hydrolysis of the anterior pituitary could be observed. In two patients there was isolated simultaneously from the serum a crystallized fraction which exhibited enzymic activity, and showed the same specific activity as the enzymes obtained from the urine of these patients. RUTH BERGGREN (Chem. Abstr.).

The Problem of the Protective Proteinases in Schizophrenic Psychoses. Mall, G. [*Allgem. Z. Psychiat.*, **119**, 110–23 (1941); *cf. C.A.*, **35**, 7426[1]; **37**, 2029[9].]

RUTH BERGGREN (Chem. Abstr.).

Isolation and Crystallization of Specific Protective Proteinases from the Urine of Patients with Basedow's Disease. Beimborn, Willi. [*Allgem. Z. Psychiat.*, **119**, 87–109 (1941).]

Protective proteinases (I) were isolated from the urine of three patients with Basedow's disease and a neurotic patient with vegetative stigmata. (I) could be isolated in the crystal form from the urine of the patients with Basedow's disease; (I) were highly active and predominantly specific to thyroid substrate. In addition to a marked hydrolysis of thyroid substrate they produced a somewhat smaller breakdown of substrates of reproductive glands. Substrates of adrenal glands and pituitary were hydrolyzed least. In one case a highly active protective proteinase, monospecific to the thyroid gland, could be isolated. The urine of the neurotic patient with vegetative stigmata yielded enzymes which hydrolyzed the substrates of testes and ovaries, but no proteinases which hydrolyzed thyroid, pituitary or adrenal glands could be isolated. RUTH BERGGREN (Chem. Abstr.).

The Isolation of Crystallized Proteinases from the Urine of Paralytic Patients. Mall, G., and Winkler, W. [*Allgem. Z. Psychiat.*, **119**, 77–86 (1941); *cf. C.A.*, **37**, 2029[9].]

A total of 421 combined urines of 7 paralytic patients were used. Upon precipitation of the neutralized urine (1 : 1) with MeOH an enzyme-containing precipitate was obtained which, after being dried and pulverized, was used as the starting material for the isolation of the enzymes. A concentrated enzyme solution can be prepared by extraction of each 5 gm. dried enzyme powder with 200 c.c. distilled water in the incubator with sterile precautions. This solution spoils very rapidly upon the slightest bacterial contamination, and simultaneously the specificity of the reactions is lost through non-specific bacterial proteases. Crystal proteins deposit from the concentrated stock solution on cooling; these proteins, if used at once, show a

high degree of enzymic activity, but in the course of a few days rapidly pass over into a reversible inactive state. These crystal proteins can be reactivated by serum and to a still greater extent by very diluted trypsin solutions. The crystals of these proteins are polyhedral; they are difficultly soluble in 0·1 N HCl or NaOH and in distilled water. Thus far reprecipitation of these crystals has not been successful. Under the action of diluting acids only a part of the crystal material dissolves. The insoluble portion dissolves in diluting NaOH. The fraction soluble in diluting HCl can be recrystallized from diluting HCl in the form of acute-angled rhombs. Upon recrystallization the fraction soluble in NaOH, however, exhibits more the form of crystalloid cocci, as described by Mall and Bersin (*C.A.*, **35**, 7426[1]). It is assumed that the polyhedral crystals adsorb the specific proteinases upon crystallization. Clearly, here it is not a case of crystallized pure proteinases, since upon fractionated salting-out with $(NH_4)_2SO_4$ the enzyme activity is bound to other crystals. The enzymes from the concentrated enzyme stock solution obtained by extraction of the dried enzyme powder can be further purified by fractionated salting-out with $(NH_4)_2SO_4$. Upon half-saturation with $(NH_4)_2SO_4$ the enzymes remain in solution while the carrier proteins are precipitated. After removal of the $(NH_4)_2SO_4$ from the filtrate by dialysis the dried residue contains HCl-soluble and NaOH-soluble fractions, both in the reversibly inactive form. They are activated consistently and specifically by trypsin in very low concentrations. RUTH BERGGREN (Chem. Abstr.).

Levinson Test for Tuberculous Meningitis. Burman, D., and Weintraub, J. [*J. Lab. Clin. Med.*, **28**, 213 (1942).]

Results indicate that this test is 94–97 per cent. accurate in diagnosing tuberculous meningitis. Therefore it is a laboratory procedure that should be used more often in the diagnosis of meningitis when the spinal fluid is clear and where no serum has been administered, since pus, red blood cells and serum render the fluid alkaline, giving false positive results.

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

Histamine in Nervous System. Kwiatkowski, H. [*J. Physiol.*, **102**, 32 (1943).]

The midbrain, cerebellum, brachial plexus, sciatic nerve and nerves containing mainly sensory fibers from the skin contain 0·6–13γ of histamine (I) per gramme of tissue in seven animal species, including man. Smaller amounts are found in cerebral cortex, little or none in the spinal cord, medulla or nerves containing mostly motor fibers (except the posterior tibial) and those connected with special sense organs. The posterior and sensory roots of the trigeminal contain no, the lingual division small, and the semilunar ganglion and the ophthalmic and maxillary divisions higher amounts of (I). Degeneration of sciatic nerve (cut 3–105 days before removal) causes a progressive increase in the concentration of (I). Extracts of blood, collected before and during nerve stimulation, show little, those of blood collected 1–4 minutes after stimulation much higher concentrations of (I). B. J. JANDORF (Chem. Abstr.).

The Metabolism of Brain Tissue in vitro with and without Glucose: The Formation of Acetylcholine and the Effect of Hydrogen Cyanide. Sanz, M. C. [*Arch. ges. Physiol.* (*Pflügers*), **246**, 597 (1943).]

Acetylcholine (I) formation occurs in a suspension of rat-brain in Locke's solution containing 0·01 M glucose. The O_2 content decreases markedly. In the absence of glucose the formation of (I) is delayed several hours. Respiration and glycolysis are increased by the addition of 0·0001 N HCN in the presence of glucose and inhibited in its absence.

A. GROLLMAN (Chem. Abstr.).

Effect of Bulbocapnine on Defensive Conditioned Reflexes. Denyabin, V. S. [*J. Physiol.* (*U.S.S.R.*), **29**, 401 (1940).]

Artificial alimentary reflexes were first depressed, then the natural ones. Increase of dose depressed the acid reflexes and finally the motor reflexes. At doses of 5–28 mgm./kgm. a marked decrease of parotid salivation occurred when 0·148 per cent. NaCl was given. Subcutaneous doses of 0·07–0·1 gm. caused sharp dilatation of pupils in dogs with severed cervical nerves; this suggests paralysis of the parasympathetic innervation of the eye.

T. LAANES (Chem. Abstr.).

Electrometric Methods of Determination of Phosphatides of the Brain Tissue. Epshtein, Ya. A. [*Biokhimiya*, **7**, 69–78 (*German summary*, 78) (1942).]

In continuation of previous work on phosphatides of the brain (*C.A.*, **35**, 1433[6]) Epshtein investigated various methods for the determination of natural phosphatides. Phosphatides can be determined by conductometric titration of fat acids liberated by saponification of the alcoholic-ether extracts of the tissue with NaOEt, or by determination of glycerophosphoric acid formed during this saponification by neutralization with BaO and electrometric titration of the Ba salts with HCl. Because of the differences in behaviour to acids and alkalis between lecithins and cephalins, it is possible to effect direct electrometric titrations for these two classes of phosphatides. Titration with 0·1 N NaOH of the alcoholic ether extract (conductometric or electrometric) gives total phosphatides, the results being comparable to those obtained by hydrolytic decomposition. On back titration with 0·1 N HCl the amount is usually somewhat greater and

corresponds to the amount found by direct acid titration. Samples of neutral extracts were titrated by the "formol" procedure with NaOH and back-titrated with HCl. The titration curve with NaOH runs at lower pH values than that without formol treatment; this first part of the curve corresponds to titration of the cephalin NH_2 group. After this part of the curve is passed, the curve rises sharply and titration of the methylated amino group of lecithin occurs (in the more basic region of the curve). Direct titration with acid, in the formol method, gives a curve indicative of the acidic groups of the phosphatides, while back-titration with alkali gives not only the phosphatides titrated as acids but also the basic groups, with a shift of the titration curve to the acid side (compared with non-formal titration). Thus, the total phosphatides can be titrated by acid formol titration or by alkali formol titration, as well as by direct alkali titration and the hydrolytic methods previously listed. Titration by HCl without formol gives cephalin, while lecithin can be determined by difference. Both phosphatides appear to exist in the alcoholic-ether solution at the isoelectric point in the form of "amphions."

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

The Influence of the Nervous System Upon the Formation of Experimental Tumours. Notik, L. V. [*Bull. biol. med. exptl. U.R.S.S.*, **9**, 507–9 (1940); *Chem. Zentr.*, **1**, 3003 (1942).]

The pre-caudal portion of the back of mice was painted with tar for six months or with 3, 4-benzopyrene for 3·5 months. Shortly before the end of such treatment or shortly thereafter, when many animals already had papillomas, the right sciatic nerve was cut and the central end treated with formol or croton oil. After 2–3 months more all animals were killed. By this time a large part of the papillomas, in contrast to the correspondingly painted controls, had regressed; and the formation of cancer was decreased.

MAURICE M. RATH (Chem. Abstr.).

Purification of Equine Encephalomyelitis Virus by Ultra-centrifugation and Maintenance of its Activity with Cysteine. Bang, F. B., and Herriott, Roger M. [*Proc. Soc. Exptl. Biol. Med.*, **52**, 177–80 (1943).]

Cysteine in 0·1 M concentration retards spontaneous inactivation of the ultracentrifuge-purified virus.

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

The Action of Formaldehyde on Nerve Tissue. Vidal, F., and Vonesch, E. E. [*Rev. asoc. med. Argentina*, **55**, 761–5 (1941); *Anales asoc. quim. argentina*, **30**, 308 (1941).]

Organic, inorganic and total P contents, solubilized in brains of human beings, cats and cattle, fixed in HCHO, were determined by the Tidsdall method (*cf. C.A.*, **16**, 1441) by use of photometry. HCHO has a premature, rapid, constant and prolonged disintegrating action on phospholipides of nerve tissue. Eight per cent. of the solid substance was extracted. About a quarter of the P contained in the brain was recovered.

E. M. S. (Chem. Abstr.).

Hypoglycemia following Alcoholic Intoxication. Tucker, H. StGeo. (jun.), and Porter, Wm. B. [*Am. J. Med. Sci.*, **204**, 559–66 (1942).]

All of four persons suffering from hypoglycemic coma after alcohol intoxication recovered when glucose solution was given intravenously. One patient was thought to have hypopituitarism. The other patients showed no evidence of endocrinologic disorder. After recovery there was only questionable evidence of impaired liver function in one patient.

RACHEL BROWN (Chem. Abstr.).

Neurotrasentin. Cavalli, F. [*Arch. ital. sci. farmacol.*, **10**, 107–20 (1941); *Chem. Zentr.*, **1**, 379–80 (1942); *cf. C.A.*, **34**, 1392^5.]

An association of trasentin (Ciba), which is $(C_6H_5)_2.CHCO_2CH_2CH_2N(C_2H_5)_2.HCl$, with the same amount of phenylethylbarbituric acid is designated neurostrasentin (Ciba). Because of the differences in solubility of these two substances the solutions of the individual components were administered simultaneously by subcutaneous injection. The toxicity of the combination in guinea-pigs corresponds to the arithmetical mean of the values of the components. A cumulative effect was not observed. In strychnine poisoning it not only reduces the number of tetanic convulsions, but often saves the life of the animal even after fatal doses of strychnine. It exerts a distinct antagonistic action in metrazole poisoning; it prevents the appearance of or abolishes the convulsions if non-fatal doses of metrazole are used. It does not impair the tonus of the isolated small intestine; after stimulation with $BaCl_2$ or acetylcholine it rapidly diminishes the contraction; it acts, therefore, on the parasympathetic nerve-endings. It inhibits the contractions of the isolated non-gravid uterus, but this action can be readily reversed by washing. The action also appears rapidly and distinctly after stimulation of the organ with endopituitrin. The action of the individual components on the isolated organs can be easily increased.

RUTH BERGGREN (Chem. Abstr.).

The Pathological Changes in the Brain in Fatal Hypoglycemia. Lawrence, R. D., Meyer, A., and Nevin, S. [*Quart. J. Med.*, **11**, 181–201 (1942).]

In six fatal cases of hypoglycemia the lesions were similar except in intensity. There occurred widespread degeneration and necrosis of nerve cells with corresponding micro- and macroglial proliferation. Homogenizing and nerve-cell changes were the predominating types

of degeneration. The cerebral cortex, the caudate nucleus and putamen were most affected. The main cause of the degeneration seemed to be failure of vital oxidative processes from the lack of glucose as a substrate, probably re-enforced by vasomotor disturbances.

JOHN T. MYERS (Chem. Abstr.).

Creatinine and Muscle Metabolism. Comparative Excretion of Creatinine in the Urine by the Insane in Periods of Quiet and Excitement. Gautier, J. A. [*Compt. rend. soc. biol.*, **135**, 853–5 (1941); *Chem. Zentr.*, **1**, 893–4 (1942).]

In a group of insane patients creatinine excretion was greatly increased (sometimes as high as 400 per cent.) during periods of excitement. The excretion is more closely related to the muscular activity than to the mental condition. L. E. GILSON (Chem. Abstr.).

Action of Diphenyloxazolidinedione on Brain Respiration at varied Temperature Levels. Fuhrman, Frederick A., and Field, John, (2nd). [*J. Pharmacol.*, **77**, 229–37 (1943); *cf. C.A.*, **36**, 5257⁴.]

The m.l.d. of 5,5-diphenyl-2, 4-oxazolidinedione (I) for rats is about 40 mgm./kgm. given intravenously. The compound irreversibly inhibits brain respiration *in vitro*, but there is a small fraction of cerebral cortex respiration which is not abolished, even by high concentrations of (I) or 5,5-dipropyl-2, 4-oxazolidinedione (II).

At 37·5° only 10 per cent. of the respiration was stable toward (I), while at 15° 36 per cent. was unaffected. Like (II) and like some narcotics, (I) decreased the O consumption of cerebral cortex slices much more markedly in the presence of glucose than in the presence of succinate.

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

Neutralization Tests with Fractions of Poliomyelitis Antiserum (Horse). Toomey, John A., McKhann, Charles F., and Fahey, Kathleen. [*J. Immunol.*, **46**, 1–7 (1943).]

Antipoliomyelitic horse serum was partially fractionated by salting-out and iso-electrical precipitation methods. Neutralization antibodies were concerned in that portion of the globulin fraction on the borderline between pseudoglobulin and euglobulin.

CHARLES A. ZITTLE (Chem. Abstr.).

Influence of X-Ray Therapy on the Function of the Hemato-encephalic Barrier in Diseases of the Central Nervous System. Surat, V. S. [*Ann. Roentgenol. Radiol. (U.S.S.R.)*, **24**, 213–19 (*in French and German*, 219), (1940).]

Therapeutic doses of X-rays given to patients suffering from multiple sclerosis and other pathological states of the central nervous system cause regular increases of permeability of the hemato-encephalic barrier, both in cerebral hemispheres and in the spinal cord. Study of the regulating function of the barrier with respect to sugar, chlorides, Ca, and K concentrations in the spinal fluid shows absence of any change in the content of these substances when the protective function is diminished as result of irradiation. It follows that the regulating mechanism is not exclusively represented by the barrier function. C. S. SHAPIRO (Chem. Abstr.).

The Sugar of the Cerebroside from the Spleen in Gaucher's Disease. Lieb, H., and Gunther, V. [*Z. physiol. Chem.*, **271**, 211–13 (1941).]

The sugar from the cerebroside isolated in Gaucher's disease in a 3-year-old-girl gave a negative fermentation test with pure yeast; it is considered to be d-galactose, which is found also in kerasin in brain substance. Others have isolated d-glucose from the cerebroside of the spleen; hence it is concluded that both cerebroglucoside and cerebrogalactoside may occur in the spleen.

EUGENE MAIER (Chem. Abstr.).

Cerebrosides. XVII: Occurrence of a Hexacosanoic Acid Among the Fat Acids of Brain Cerebrosides. Klenk, E., and Schumann, E. [*Z. physiol. Chem.*, **272**, 177–88 (1942); *cf. C.A.*, **38**, 3332⁴.]

A fraction of unsaturated acids was obtained with 10 per cent. H_2SO_4 in MeOH from a mixture of cerebrosides very poor in P. Small impurities of phosphatides were probably sphyngomyelin and ether-insoluble glycerophosphatides. After precipitation and separation of the fraction of unsaturated hydroxy-acids as Mg salts the Me ester of the remaining nervonic acid fraction was distilled in vacuo. A hexacosanoic acid was isolated from a Me ester fraction distilling at about 173°. The free acid crystallized from acetone in bright scales, m. 45–45·5°.

GERALD REED (Chem. Abstr.).

Thermal Paralysis and Metabolism of Nervous Tissue. Brachet, J., and Bremer, F. [*Arch. intern. physiol.*, **51**, 195–8 (1941).]

Oxygen consumption of minced brain from the frog, *Rana temporaria*, in the presence of Ringer glucose reaches a maximum at 31° and falls off rapidly at higher temperature; for *R. esculenta* the maximum is at 38°. These values correspond very closely to the temperatures which cause central thermal paralysis. ZELMA BAKER MILLER (Chem. Abstr.).

Effect of Chloropicrin and Bromopicrin on Nerve Fibers and Sympathetic Ganglion. Bacq, Z. M., and Coppée, G. [*Arch. intern. physiol.*, **51**, 35–50 (1941).]

Following chloropicrin (saturated solution) there is a repetitive response (6–40 impulses) to

an isolated stimulus in the nerve cell and fiber. After excitation, subjection of the sympathetic ganglion of the cat to chloropicrin causes tonic activity (10–100 impulses/minute). Bromopicrin excites the ganglionic cells directly, and appears to paralyze conduction in the fiber without previous increase in the excitability. This period of potentiation by chloro- and bromopicrin is followed by a block in conduction and transmission of impulse. Results with chloro- and bromopicrin are compared with allyl isothiocyanate, monobromoacetic acid and β, β^1-dichloroethyl-sulfone. The authors conclude that the effects observed might be caused by sensitization to K ions. ZELMA BAKER MILLER (Chem. Abstr.).

Lipides of Muscle and Brain in Rats Deprived of Tocopherol. Heinrich, Milton R., and Mattill, H. A. [*Proc. Soc. Exptl. Biol. Med.*, **52**, 344–6 (1943).]

In rats on a vitamin E-deficient diet the muscle cholesterol was significantly increased and total muscle lipides were slightly increased. Brain cholesterol was markedly increased, especially free cholesterol. L. E. GILSON (Chem. Abstr.).

Blood Glutathione in Relation to Stimulation of the Vagus and Sympathetic: III. Vlasovskii, I. P. [*Med. Exptl.*, 2027.]

Glutathione (I) of the blood was studied as the test substance to explain the participation of the vegetative nervous system in the oxidation processes. (I) was determined in the blood of the horse donor before and after stimulation of the vagus and sympathetic, as well as in the horse recipient before and after transfusion of blood from horses in which the sympathetic had been stimulated. The studies showed the increase of the reduced forms and diminution of the oxidized form of (I) in the blood of the donor, in relation to stimulation of the vagus; on stimulation of the sympathetic the reverse was observed. The transfusion of the blood of the previously vagus-stimulated donor also caused an increase of the reduced form; transfusion of blood from a donor with previously stimulated sympathetic increased the oxidized form of (I) in the recipient. HELEN LEE GRUEHL (Chem. Abstr.).

Brain Cephalin, A Mixture of Phosphatides. Separation from it of Phosphatidyl Serine, Phosphatidyl Ethanolamine, and a Fraction Containing an Inositol Phosphatide. Folch, Jordi. [*J. Biol. Chem.*, **146**, 35–44 (1942).]

The cephalin fraction of brain phosphatides is a mixture of phosphatidyl serine (I) (*C.A.*, **35**, 4787[9]), phosphatidyl ethanolamine (II), and one or more phosphatides, some containing inositol (III) as a constituent (*C.A.*, **36**, 2605[5]). The fraction containing (III) is less soluble in alcohol than either (I) or (II). (II), unlike cephalin, to which its composition was formerly assigned, is soluble in alcohol. With the exception of (II) the phosphatides in the cephalin fraction of brain lipides are strongly acidic and are isolated as K and Na salts.

PHILIP L. HARRIS (Chem. Abstr.).

Effect of Hypophysectomy on the Concentration of Ascorbic Acid in the Adrenals of the Rat. Tyslowitz, R. [*Endocrinology*, **32**, 103–8 (1943).]

Adrenal weight in hypophysectomized male rats 21 to 40 days old decreased gradually, beginning within two days after operation. Ascorbic acid concentration in the adrenals increased briefly before beginning its gradual decline on about the third day. This decline was not specific, for it was shared by the ascorbic acid concentration of testis, liver, kidney and blood serum. Values for female rats were similar. They were increased by treatment with pituitary extracts and remained higher where hypophysectomy was incomplete. Starvation of normal rats for six days reduced liver and kidney ascorbic acid more than that of adrenals, testis or blood serum. Thyroidectomy did not alter findings in hypophysectomized animals. It is apparent that adrenal ascorbic acid levels are not reliable indexes of cortical activity.

KATHRYN KNOWLTON (Chem. Abstr.).

The Significance of Carbon Monoxide Injury in Brain-stem Pathology. Sturm, Alexander. [*Wien. med. Wochschr.*, **91**, 709–13 (1941).] C. L. B. (Chem. Abstr.).

2. Pharmacology and Treatment.

Sodium Succinate as an Antidote for Barbiturate Poisoning and in the Control of the Duration of Barbiturate Anesthesia. Soskin, Samuel, and Taubenhaus, Matthew. [*J. Pharmacol.*, **78**, 49–55 (1943).]

Na succinate is a safe and effective antidote against toxic doses of Na pentobarbital in rats. Its action appears to be the maintenance of the metabolism of the brain, through oxidation of the succinic acid, during the period in which the oxidation of glucose, lactate and pyruvate in the brain is inhibited by the barbiturate (*cf. C.A.*, **27**, 781[5]). For best results it should be given intravenously after the barbiturate; if given prophylactically before the barbiturate it can be injected intramuscularly or intravenously. Na succinate also shortens the duration of both Na pentobarbital and Na amytal anesthesia in rats. A case of barbiturate poisoning in a woman is described, in which the use of Na succinate appeared to be of great benefit.

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

Reduction of Fluid Loss from Damaged (Burned) Tissues by a Barbiturate. Beecher, Henry K., and McCarrell, Jane D. [*J. Pharmacol.*, **78**, 39–48 (1943).]

In experimental animals burned with hot water the administration of Na pentobarbital greatly decreased loss of fluid and protein from the burned area. Under the same conditions morphine had no curtailing effect on fluid loss. L. E. GILSON (Chem. Abstr.).

The Determination of Sodium Pentothal in Blood. Hellman, L. M., Shettles, L. B., and Stran, Herbert. [*J. Biol. Chem.*, **148**, 293–7 (1943).]

A simple method for the determination of Na pentothal in blood is described. This particular barbiturate has a maximum ultra-violet absorption at 2880 A. A recovery of 90 per cent. is obtained when known amounts of the drug are added to bank blood.

H. J. PREBLUDA (Chem. Abstr.).

Removal of Red Cells from the Active Circulation by Sodium Pentobarbital. Hahn, P. F., Bale, W. F., and Bonner, J. F. (jun.). [*Am. J. Physiol.*, **138**, 415–20 (1943); *cf. C.A.*, **37**, 6866.]

When the circulating red blood cells of the dog are tagged with other dog cells containing the radioactive isotope of Fe, and nembutal anesthesia is induced, removal of the engorged spleen shows that up to 30 per cent. of the circulating red cells may be present in this organ as shown by the radioactivity of the contained cells. When red cells have been sequestered from the circulation by the influence of nembutal, the actively circulating cell mass can be determined by the tagged-donor-cell technique. Administration of adrenaline by vein results in an increase in the actively circulating cells as shown by dilution of the tagged cells. When the latter procedure is applied to splenectomized animals there is still a marked response to adrenaline, an increment of red cells being added to the circulation. E. D. WALTER (Chem. Abstr.).

The Pharmacology of Sodium Cyclopentenylallyl Barbiturate (Cyclopal). Dille, James M., and Kipple, Helen M. [*Anesthesiology*, **4**, 135–44 (1943).]

Na cyclopentenylallyl barbiturate, known as cyclopal-Na, belongs to the group of intermediate acting barbiturates. After intravenous injection of 80 mgm. per kgm. in rabbits the average duration of sleep, as measured by the duration of the absence of the righting reflex, was 114 minutes. A therapeutic ratio of 5·53 for male rats, 3·97 for female rats and 3·45 for male albino rabbits was found. A slightly lowered response in rabbits was noted after the second and following days when anesthetic doses of cyclopal-Na (80 mgm./kgm.) were administered daily over a period of time. Cyclopal is eliminated rapidly by some process of detoxication. Excretion plays practically no part in the elimination of this drug, since bilateral nephrectomy does not change the response to anesthetic doses. Accumulation occurred in rabbits only when anesthetic doses of 60 mgm. per kgm. were repeated at intervals of two hours; accumulation did not occur when doses of 30 mgm. per kgm. were administered at 2-hour intervals for 12 hours.

RUTH BERGGREN (Chem. Abstr.).

The Effects of Nembutal (Sodium Pentobarbital) and Scopolamine on Human Subjects. Hawk, M. H., and Wangeman, C. P. [*Anesthesiology*, **4**, 238–46 (1943).]

The experiments demonstrate that nembutal (I) has definite stimulative and depressant qualities. The addition of scopolamine (II) lessens the depressing effects of (I). This is particularly true with respect to minute volume exchange of air to and from the lungs. There is less depression of the respiratory functions with (I) than with morphine. The combination of (I) and (II) causes less respiratory depression than that caused by morphine and (II). The addition of (II) to (I) provides a less profound, longer acting and more pleasant sedation than (I) alone, in spite of the apparent greater restlessness. It is believed that the combination of (I) and (II) is satisfactory for preoperative sedation and mucus inhibition, but that the combination cannot be depended upon to relieve pain. RUTH BERGGREN (Chem. Abstr.).

The Comparative Rate of Gastrointestinal Absorption of Barbital, Sodium Barbital and Elixir of Barbital N. F. VII. Seeberg, Victor P., and Dille, James M. [*J. Am. Pharm. Assoc.*, **32**, 133–7 (1943).]

Tablets of Na barbital administered after crushing are absorbed more rapidly from the gastrointestinal tract of 24-hour starved cats than crushed tablets of barbital or barbital administered in the form of elixir of barbital N. F. VII. Crushed tablets of barbital are absorbed at about the same rate as the elixir. After oral administration the fact that only small amounts of the drug reach the colon indicates that absorption takes place mainly in the small intestine. Absorption of isotonic solutions from the ligated intestine is about the same for barbital and Na barbital provided that both are in solution. Absorption of barbital after administration of elixir of barbital N. F. VII is much slower than was expected. While depression is greater than the blood level of barbital would indicate, this can be explained by the presence of alcohol in the elixir. The delayed absorption of the barbital in the elixir probably occurs because the glycerol present delays the passage of the elixir into the intestine from the stomach.

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

Relationship between Chemical Structure and Inhibitory Action of Barbituric Acid Derivatives on Rat-brain Respiration in vitro. Fuhrman, Frederick A., and Field, John (2nd). [*J. Pharmacol.*, **77**, 392–400 (1943).]

In homologous series of 5-alkyl-5-ethylbarbiturates and 5-alkyl-5-allylbarbiturates, with increasing length of the alkyl side chain there is a decrease in the molar concentration required to produce a 50 per cent. decrease in the O consumption of rat cerebral cortex slices *in vitro*.

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

Alcohol and Cerebral Vasodilatation. Loman, Julius, and Myerson, Abraham. [*New Engl. J. Med.*, **227**, 439–41 (1942).]

A 25 per cent. solution of EtOH in physiological saline was given intravenously to human subjects in doses sufficient to produce definite signs of intoxication. In 2 of the 10 subjects there was a decrease in O uptake by the brain (lowered arteriojugular difference). The uptake of glucose by the brain was not significantly altered, nor was there any significant change in cerebrospinal fluid pressure. The results indicate that EtOH is not an efficacious vasodilator.

E. R. MAIN (Chem. Abstr.).

Antagonistic Actions of Narcotics and Analeptics on the Central Nervous System. II: Action of d- and l-Ephedrine and their Synergism with Metrazole and Strychnine on the Narcotized Cat Spinal Cord. Koll, W., and Ergang, M. [*Arch. exptl. Path. Pharmakol.*, **199**, 577–605 (1942); *cf Koll, ibid.*, **184**, 365 (1937).]

In decerebrate cats narcotized with avertin, ethylurethan or pernocton, the spinal cord was severed back of the last rib and the awakening action of ephedrine, metrazole and strychnine was studied by the effect on various reflexes. These last three drugs act synergistically with each other.

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

Antagonism between Chloralose and Metrazole. Dybling, O., and Dybing, F. [*Arch. exptl. Path. Pharmakol.*, **199**, 435–7 (1942).]

Metrazole awakens rats lightly anesthetized with chloralose.

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

Effects of Pentamethylenetetrazole (Metrazole) on the Stomach. Mautner, Hans, and Yetwin, I. Jacques. [*J. Am. Pharm. Assoc.*, **32**, 17–20 (1943).]

After injection of metrazole in rats there is an increase in fluid content of the stomach. This is due to cessation of gastric motility, possibly also to slight hypersecretion. The effect on gastric motility cannot be attributed to an increased output of adrenaline, but is probably due to a central effect on the antonomic nervous system. These results corroborate the findings of several investigators in that a stimulation of the hypothalamic region simultaneously regulates both sympathetic and parasympathetic divisions of the autonomic nervous system.

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

Liberation of Potassium from the Dog Brain by the Action of Convulsant Drugs. Cirardo, V. H., Torino, A., and Fendrik, B. [*Rev. inst. bacteriol. "Carlos G. Malbran" (Buenos Aires)*, **11**, 179–84 (1942).]

See *C.A.*, **37**, 1775.

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

Lung Edema from Metrazole. Riechert, Willi. [*Arch. exptl. Path. Pharmakol.*, **197**, 620–8 (1941); *Chem. Zentr.*, **1**, 3230 (1942).]

The smallest intravenous dose of metrazole producing convulsions in rats was 40 mgm./kgm. This dose did not cause edema of the lungs, but 60 mgm./kgm. produced lung edema lasting 7–8 hours. Repeated intraperitoneal injections of 20 mgm./kgm. produced convulsions and lung edema. Small doses of metrazole (10–30 mgm./kgm.) had neither a favorable nor an unfavorable effect on lung edema provoked by phosgene.

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

Liberation of Potassium in Dog Brain by the Action of Convulsant Drugs. Cicardo, V. H., Torino, A., and Fendrik, B. [*Rev. soc. argentina biol.*, **18**, 308–14 (1942); *cf. C.A.*, **36**, 5231[8].]

In dogs the intravenous injection of convulsive doses of either metrazole or azoman (3-ethyl-4-cyclohexyl-1,2,4-triazole) caused a liberation of K by the brain into the blood stream. Curare-like substances decreased this liberation through their antagonistic action on the nerve centers.

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

Insulin Reaction and the Cerebral Damage that may Occur in Diabetes. Murphy, Francis D., and Purtell, James. [*Am. J. Digestive Diseases*, **10**, 103–7 (1943).]

A case of diabetes is reported in which hypoglycemic shock resulted in cerebral damage and in the following year, death. The symptomatology and pathology of hypoglycemia and the mechanism of the action of insulin and of hypoglycemia on the central nervous system are discussed.

MARJORIE ANCHEL (Chem. Abstr.).

Glucose Tolerance and Insulin Tolerance in Mongolism. Bixby, Emily May, and Benda, Clemens E. [*Am. J. Mental Deficiency*, **47**, 158–66 (1942); *cf. C.A.*, **36**, 826[5].]

Further evidence for abnormal sugar metabolism in mongolism was obtained with the Exton-Rose divided-dose glucose-tolerance test; in most instances the blood glucose (I) concentration

continued to rise after the second half-dose instead of falling normally. In the insulin (II)-tolerance test the fasting levels of (I) and the fall of about 50 per cent. during the first 20 or 30 minutes after (II) administration were normal in mongoloids, but (I) rose again at a subnormal rate, being 13 to 29 mgm. below the fasting level two hours after (II) was given. The response of (I) to adrenaline, given two hours after (II), was also subnormal in mongoloids.

W. M. SPERRY (Chem. Abstr.).

The Use of Prostigmine in the Treatment of Poliomyelitis. Kabat, H., and Knapp, M. E. [*J. Am. Med. Assoc.*, **123**, 989–95 (1943).]

Following subcutaneous administration of prostigmine the skeletal muscle hypertonus and proprioceptive reflex hyperirritability, as well as the inco-ordination in poliomyelitis patients, are decreased. This action of prostigmine is not counteracted by atropine, and seems to depend on a change in spinal cord synaptic function. S. MORGULIS (Chem. Abstr.).

Ether and Metabolism in the Cerebral Cortex. Craig, F. N. [*Science*, **98**, 68–9 (1943).]

The effect of ether on the O uptake and lactic acid output by slices of cerebral cortex of the cat in Ringer-phosphate-glucose medium is given in a table.

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

Influence of Phenylalkylamines on Oxygen Uptake of Brain Tissue. Froentjes, W. [*Enzymologia*, **10**, 216–19 (1942) (*in German*).]

No important differences were found between d-, l- and dl-methylphenethylamines (benzedrine) in their ability to decrease glucose oxidation by brain tissue *in vitro* and to antagonize the depressing action of tyramine on this oxidation. The action of α-phenylpropylamine was similar to, but stronger than, that of benzedrine; the d-isomer was about 20 per cent. more active than the l-compound. On intestine, d- and l-ephedrines had equally strong actions. In the treatment of narcolepsy in children d- and dl-benzedrines were about three times as potent as l-ephedrine. L. E. GILSON (Chem. Abstr.).

The Isoelectric Point of Brain Cells in Intoxication by Hypnotics: II. Aizawa, T. [*Japan. J. Med. Sci., VII. Social Med. Hyg.*, **3**, 192–3 (1940); *Chem. Zentr.*, **2**, 923 (1942); *cf. C.A.*, **35**, 5187⁶.]

In the small and large pyramidal cells from the cerebrum of rabbits after administration of phenobarbital the pH was 2·6–5·8, the isoelectric point 4·2; after dial, 2·6–5·4, and 4·0; after sulfonal 2·2–4·8, and 3·6 respectively. ALFRED BURGER (Chem. Abstr.).

Eserine, Acetylcholine, Atropine and Nervous Integration. Gesell, R., and Hansen, E. T. [*Am. J. Physiol.*, **139**, 371–85 (1943).] E. D. WALTER (Chem. Abstr.).

Diffusion of Sulfonamides from the Blood into the Cerebrospinal Fluid. Bechgaard, Poul, Löhse, Edel, and Vermehren, Emil. [*Nord. Med.*, **12**, 3247–9 (1941); *Chem. Zentr.*, **1**, 638 (1942).]

Sulfonamides were given by mouth in successive doses of 2, 2 and 1 gm. at 4-hourly intervals. The concentration of each drug in per cent. of that found in the blood 10–20 hours after the first dosage was: sulfapyridine, 69 per cent.; sulfathiazole, 19 per cent.; sulfamethylthiazole, 11 per cent. These results might be altered in cases with pathological changes in the meninges.

W. C. TOBIE (Chem. Abstr.).

Effect on the Electrical Activity of the Cortex of Certain Depressant and Stimulant Drugs—Barbiturates, Morphine, Caffeine, Benzedrine and Adrenaline. Gibbs, Frederic A., and Maltby, George L. [*J. Pharmacol.*, **78**, 1–10 (1943).]

Frequency analyses of the encephalograms showed that in normal human subjects phenobarbital, pentothal and morphine caused a shift in frequency to the slow side comparable to that occurring in sleep. Caffeine, benzedrine and adrenaline caused a shift in frequency to the fast side comparable to that occurring with attention. Of the drugs studied, the one (pentothal) which produced the greatest clinical evidence of depression caused the greatest shift to the slow side, and adrenaline, which produced the greatest stimulation, caused the greatest shift in the other direction. The direction of the change in frequency was constant for a given class of drugs, but the direction of the change in voltage level varied with dosage and differed for drugs of the same class. L. E. GILSON (Chem. Abstr.).

The Antineuritic Activity of Vitamin B_1 Homologs and Analogs: II. Schultz, Fritz. [*Z. physiol. Chem.*, **272**, 29–61 (1941); *cf. C.A.*, **35**, 1839⁸.]

The previous work showed that (1) substances with the same minimum curative dose may not require the same time for complete cure when that dose is used; (2) different homologs show a different penetrating strength; (3) in large doses certain substances fundamentally different in structure from vitamin B_1 effect cures the poor reproducibility of which casts doubt on the vitamin nature of the substance. On the basis of Funk's idea that the cure of acute beriberi can come about either through supplying the specific vitamin or through measures which allow sudden mobilization of reserve vitamin from organs and tissues, a distinction can be drawn between true vitamin activity and a simulated vitamin activity. A mobilization of residual

vitamin, which must be taken as non-specific cure, cannot be repeated. Accordingly, to have true vitamin activity a substance must be able to cure repeatedly beriberi spasm occurring several times in the same animal (repeated cure). It must be able also to keep the animal alive after cure, for a long time, when continually added to the diet (lasting cure), or must be able to prevent appearance of symptoms (prophylaxis). Aneurine, 2^1-ethylaneurine, 2^1-propylaneurine and ethylaneurine were administered in a single dose, subcutaneously, after the onset of the spasm in pigeons on a diet deficient in vitamin B_1. If the spasm was cured, a second dose was given after a second spasm had developed, to test "repeated cure." If this was cured, the "lasting cure" was tested for by giving daily doses. Tables show the curative dose after each spasm, the time necessary for cure, and the survival time, for each of the four substances. All three homologs of vitamin B_1 tested were found to have true vitamin activity according to the criteria of repeated cure and lasting cure. The activity of the substances tested is proportional to the survival time, and is independent of the rapidity of effect after administration of the curative dose. Two compounds previously shown to have a pseudo-antineuritic action failed entirely to achieve a second cure, or a lasting cure. The three active aneurin homologs are believed to act directly, and not by conversion in the organism to the natural vitamin. This conclusion is based on the facts that the activity of one of the homologs is identical with that of the natural vitamin, that doses of the less active substances higher than the curative dose do not result in greater activity, and that the ratio of the survival time to that on vitamin B_1 remains the same even if the dose is doubled or tripled. The results confirm the previous finding that vitamin B_1 activity is not specific, but is common to a number of homologous compounds, which may possess it in varying degrees. MARJORIE ANCHEL (Chem. Abstr.).

Inactivation of Cholinesterase by Morphine, Dilaudid, Codeine and Desomorphine. Wright, C. I., and Sabine, J. C. [*J. Pharmacol.*, **78**, 375 (1943).]

The above four drugs have more or less inhibiting action on cholinesterase from human, dog or rabbit serum, and human or rabbit brain. The inhibition is only partly competitive.

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

Mode of Action of Sympathomimetic Drugs. XI: Influence of Tonephin on Sympathetic Stimulation. Malorny, G. [*Arch. exptl. Path. Pharmakol.*, **200**, 176 (1942).]

Tonephin sensitizes the decerebrate cat to adrenaline and increases the irritability of the peripheral sympathetic nerves. Tachyphylaxis is readily produced.

XII: Influence of Thyroxine and Diiodotyrosine on Specific Sympathetic Receptors. [*Ibid.*, 187.]

In decerebrate cats, thyroxine stimulates the sympathetic nerves and sensitizes the animal to adrenaline. The effect reaches a maximum about five hours after the thyroxine injection. Tyrosine and diiodotyrosine have similar but weaker actions. L. E. GILSON (Chem. Abstr.).

dl-Glutamic Acid Hydrolysis in Treatment of Petit Mal and Psychomotor Seizures. Price, J. C., Waelsch, H., and Putnam, T. J. [*J.A.M.A.*, **122**, 1153 (1943).]

The use of dl-glutamic acid was suggested on the following considerations: Since the unnatural isomer is excreted in the urine when a racemic amino-acid is administered 1 molecule of d-glutamic acid-HCl should furnish 1 molecule of HCl in addition to 2 COOH groups, and the l-glutamic acid would also furnish 1 equivalent of HCl. Furthermore, l-glutamic acid is thought to be the only amino-acid metabolized by brain tissue. Enough dl-glutamic acid-HCl was given daily to acidify the urine to about pH 5·0 (4 gm. three times daily). With this medication seizures decreased in frequency and mental and physical alertness increased. *Grand mal* seizures were not affected. S. MORGULIS (Chem. Abstr.).

A Comparison of Atropine and Curare as Antagonists of Acetylcholine. Luco, J. V., and Altamarino, M. [*Am. J. Physiol.*, **139**, 520 (1943).]

Large doses of atropine inhibit the muscular response to acetylcholine in cats. Larges doses of curare block the glandular response to acetylcholine. The doses of atropine capable of inhibiting the responses to acetylcholine are directly proportional to the acetylcholine thresholds of the effectors used. With curare this relationship is reversed. An explanation is given for the differences between the nicotinic and muscarinic activities of acetylcholine.

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

The Course of Narcosis at Different Times During the Twenty-four-hour Period. Edlund, Y., and Holmgren, H. [*Z. ges. exptl. Med.*, **107**, 26–52 (1940).]

Studies on the speed of narcosis in mice induced by avertin and evipan, while observing the liver rhythm in the course of 24 hours, showed an increased detoxifying action of the liver when it was rich in glycogen at about 6 a.m. The induction time was increased, and several animals did not undergo narcosis with the dose employed. Animals which were narcotized in the glycogen-poor phase of the liver, about 11 a.m., slept much sooner and without exception. This group exhibited a relatively great narcosis mortality of 21 per cent.

R. STAEMPFLI, MAURICE M. RATH (Chem. Abstr.).

Treatment of Distemper in Dogs with Wheat-germ Oil (Vitamin E-neuromuscular Factor). Vogt-Moller, P. [*Tierarztl. Rundschau*, **48**, *No.* 31/32, 274–5 (1942).]

Previous treatment of cows and sows for sterility with wheat-germ oil demonstrated the presence of a factor which cures neuromuscular symptoms. In distemper of dogs the nervous system was generally involved in 30–50 per cent. of the cases observed in Denmark in 1940 and 1941. Of 90 animals, one-third were untreated, one-third received daily subcutaneous injections of 10 mgm. tocopherol, and one-third were given 5 c.c. of wheat-germ oil fortified by 10 mgm. of tocopherol. The number of deaths in the respective groups were 14, 16, 12, total number of nervous complications 21, 23, 5. Of all animals with nervous complications 11, 12, 2 survived.

ERICH KAUFMANN (Chem. Abstr.).

The Antagonistic Action of Sodium Amytal and Benzedrine Sulfate (Amphetamine) in Serial Epileptic Episodes. Prudholme, Charles. [*Med. Bull. Veterans' Administration*, **19**, 186–90 (1942).]

The profound and long-continued narcosis consequent upon Na amytal used to control serial convulsive episodes of idiopathic and symptomatic epilepsy has been shortened by the antagonistic action of benzedrine sulfate. The associated dangers of respiratory infection and management of difficult overt behaviour seemingly have been minimized.

RACHEL BROWN (Chem. Abstr.).

Pharmacodynamic Test of Aneurine—the Action on Nervous Conductivity and Transmission (Neuromuscular and Ganglionic Transmission). Chauchard, Paul. [*Compt. rend. soc. biol.*, **135**, 869–72 (1941); *Chem. Zentr.*, **1**, 634 (1942); *cf. C.A.*, **36**, 2594[5].]

The pharmacodynamic action of the preparation on conduction in nerve, on neuromuscular transmission, and on ganglionic transmission in frogs was described. The significance of this action was stressed, since this is not an ordinary poison but a compound necessary for the function of the nerves.

HELEN LEE GRUEHL (Chem. Abstr.).

Effects of Strychnine on the Isolated Nerve. Coppée, G., and Coppée-Bolly, M. H. [*Arch. intern. physiol.*, **51**, 97–130 (1941).]

The demarcation potential is not modified. The speed of propagation of the impulse can be reduced to as little as 1/10 of its initial value with concentrations of 1/500,000. At the same concentration the amplitude of the electrical response of the nerve fiber is diminished. The duration of the action potential is lengthened. The negative after-potential is reduced in amplitude and in duration, and a positive after-potential appears. The relative and abstract refractory periods are lengthened. The refractory phase of conduction is longer than the abstract refractory phase of excitation. The rheobase is reduced with low concentrations of strychnine (10^{-6} and 10^{-7}) and increased by higher concentrations. The chronaxie of nerves of small diameter is not affected, but in nerves of large diameter it is decreased but returns to normal in several hours. The period of rhythmic response of a decalcified nerve is not affected by strychnine. The block in conduction evoked by strychnine is attributed to reduction in action potential and in excitability.

ZELMA BAKER MILLER (Chem. Abstr.).

Bone Marrow and Peripheral Nervous System in Chronic Manganese Poisoning. (Pathological Anatomy of Manganism.) Voss, H. [*Arch. Gewerbepath. Gewerbehyg.*, **10**, 550–68 (1941); *Chem. Zentr.*, **1**, 1906–7 (1942).]

In two cases of chronic Mn poisoning changes in the bone marrow and in the peripheral nervous system were found. In one case the atypical course of the poisoning was manifested clinically as amyotrophic lateral scleorsis with bulbar symptoms. Anatomical findings existed corresponding to the malfunctioning observed. In another case there were certain pyramidal tract symptoms. Anatomical study showed mainly extensive degeneration of the right lateral pyramidal tract and of both sciatic nerves, with pronounced vessel changes in the affected areas.

MAURICE M. RATH (Chem. Abstr.).

Concentration of Procaine in the Cerebrospinal Fluid of the Human Being after Subarachnoid Injection. Koster, H. [*Arch. Surg.*, **46**, 301–6 (1943).]

At the moment of injection the maximum concentration of procaine is that of the solution, 43 mgm. per c.c. In 10 minutes it falls to 2 mgm. per c.c. and then falls slowly until anesthesia wears off. At the moment of injection the concentration three interspaces above the site of injection is 0, but after 5 minutes it becomes 4 mgm. per c.c.; it falls rapidly for 4–5 minutes and then slowly disappears. With the patient in the Fowler position the concentration in the cisterna magna never went over 0·18 mgm. per c.c., and was frequently less than 0·02 mgm.

JOHN T. MEYERS (Chem. Abstr.).

Experimental Application of Sulfonamide Drugs to the Cerebral Cortex. Ingraham, Franc D., and Alexander, Eben (jun.). [*New Engl. J. Med.*, **227**, 374–8 (1942).]

When powdered sulfanilamide, sulfathiazole or sulfadiazine was applied directly to the cerebral cortex of cats under sterile and non-sterile conditions, there was little inflammatory reaction except in one treated under non-sterile conditions. Sulfadiazine applied to the cerebral cortex of monkeys caused no perceptible inflammatory reaction except in one in which the bone

flap was left out. It was concluded that sulfadiazine powder can be safely used in the presence of gross contamination when the brain is not severely damaged. Further work is needed to determine whether it can be used in more complex injuries.

E. R. MAIN (Chem. Abstr.).

Bismuth in Heine-Medin's Disease. The Salts of Heavy Metals in Diseases Caused by Neurotropic Viruses. Calabrese, Alberto. [*Semana méd.* (*Buenos Aires*), **1**, 531–42 (1943).]

The treatment must be initiated in the first stage of the disease to prevent permanent neural damage. Water-soluble Bi is given intramuscularly, or in very severe cases—with due precautions—intramuscularly at the rate of 3 to 4 mgm. Bi per kgm. weight. The dose is repeated after 12 hours. Simultaneously 1 to 2 mgm. fat-soluble Bi per kgm. is given intramuscularly. This treatment is continued during the acute stage, while later during the subacute stage only the solution in oil is used. The appearance of stomatitis and reduced urine volume must be watched for. The 58 cases reported showed generally good results.

A. E. M. (Chem. Abstr.).

Pharmacodynamic Action of Thiamine on Vestibular Chronaxia in Normal Pigeons. Mouriquand, G., and Coisnard, J. [*Compt. rend. soc. biol.*, **136**, 595–7 (1942.)]

A single large dose of thiamine depressed vestibular chronaxia for 20 minutes, then raised it above normal for 13 hours. This was followed by a slow decrease to below normal, where it remained for four days, then a gradual return to normal. L. E. GILSON (Chem. Abstr.).

Effect of Repeated Injections of Thiamine. [*Ibid.*, 597–8.]

Repeated daily injections first depressed vestibular chronaxia then raised it by steps to a high plateau, where it remained 3½ days after the injections were discontinued. A slow descent with a dip below normal followed. L. E. GILSON (Chem. Abstr.).

Pharmacological Action of Choline Glycerophosphoric Ester Prepared by Enzyme Action and Synthetically. Jeney, A. v., Mihalik, I., and Uri, W. J. [*Arch. exptl. Path. Pharmakol.*, **199**, 99–112 (1942); *Chem. Zentr.*, **1**, 3229 (1942).]

For synthesis of choline glycerophosphoric ester (I) choline chloride was converted to choline sulfate by Ag_2SO_4, then to free choline by $Ba(OH)_2$. The choline solution was refluxed 30 hours with an equivalent amount of glycerophosphoric acid. The purified (I) m. 104–5°. (I) was prepared from lecithin with the aid of lecithinase "B" by the method of Contardi and Ercoli (*C.A.*, **29**, 8018). Both specimens of (I) had the same effect as choline chloride on blood pressure and intestine of cats and on frog heart. (I) is probably hydrolyzed in the body by choline phosphatase. L. E. GILSON (Chem. Abstr.).

Effect of Spinal Injection of Cocaine on Blood Pressure in Dogs. Jourdan, F., and Guillet, R. [*Compt. rend. soc. biol.*, **136**, 589–91 (1942).]

Injection of 3–10 c.c. of 1 per cent. cocaine solution into the subarachnoid space causes paralysis of the posterior roots and a small decrease in blood pressure. This decrease becomes greater as more of the body is anesthetized. L. E. GILSON (Chem. Abstr.).

Inhibiting Action of Tabernanthe iboga on Serum Cholinesterase. Vincent, D., and Sero, I. [*Compt. rend. soc. biol.*, **136**, 612–14 (1942).]

A very diluted extract of the roots of *Tabernanthe iboga* (family Apocynaceae), containing ibogaine, inhibits the action of cholinesterase of human or horse serum. Ibogaine has an anticholinesterase activity of the same order as eserine. Crude impure ibogaine is more potent than the crystallized alkaloid. L. E. GILSON (Chem. Abstr.).

The Central Action of the Sulfonamides. Marx, Hellmut. [*Klin. Wochschr.*, **21**, 30–1 (1942); *Chem. Zentr.*, **1**, 3231 (1942); *cf. C.A.*, **36**, 7129.]

The action of sulfonamides on the accompanying symptoms of infectious diseases, as reduction of the fever and the leucocytosis and the effect on other centrally controlled vegetative regulations, is considered. RUTH BERGGREN (Chem. Abstr.).

The Role of Glutathione and Vitamin C in Detoxication. Kovacs, Zoltan. [*Klin. Wochschr.*, **21**, 688–92 (1942).]

The use of vitamin C and glutathione in various toxic states is described. This treatment was, for the most part, successful. The rigor which may appear after intravenous injection of vitamin C + glutathione and the subsequent rise in temperature by about 2–3° is an unpleasant side reaction. It is probably due to the presence of the organically bound S in the sulfhydryl group (SH) of the cysteine in the glutathione molecule. If, however, the glutathione + vitamin C is administered intramuscularly, subcutaneously or perorally, this side reaction is absent although the curative effect is retained. The rigor which appears after intravenous injection is always evident in septic cases but rarely in toxic and allergic patients.

RUTH BERGGREN (Chem. Abstr.).

Effect of Chloroform and Ether on the Sensitivity of Muscle to Acetylcholine. Torda, Clara. [*J. Pharmacol.*, **77**, 350–6 (1943).]

In low concentrations ($CHCl_3$ 0·0025–0·03 per cent ; Et_2O 0·5–1·5 per cent.) the drugs increase the response of frog rectus abdominis muscle to acetylcholine (I), somewhat higher concentrations decrease the response, and still higher concentrations ($CHCl_3$ 0·16 per cent. by volume or higher ; Et_2O above 3·7 per cent.) cause contracture. Physostigmine increases the response of deeply chloroformed muscles to (I). $CHCl_3$ and Et_2O increase the response of fully eserinized muscle to (I), but even in high concentrations they do not counteract the effect of atropine in inhibiting the action of (I). Atropine does not modify the contracture provoked by high concentrations of $CHCl_3$ and Et_2O. This contracture is probably the result of processes which do not involve (I). Presumably $CHCl_3$ and Et_2O increase the excitability of the parasympathetic nervous system both by inhibiting the destruction of (I) by cholinesterase and by increasing the sensitivity of the effector organs to (I). L. E. GILSON (Chem. Abstr.).

Action of Benzene on Certain Central Nervous Regulating Mechanisms. Guerra, Francisco (Perez-Carral). [*J. Pharmacol.*, **77**, 336–42 (1943).]

Inhalation of C_6H_6 vapor produces sympathomimetic reactions in animals. In dogs and rabbits it exercises a specific central action on a zone of integration of panting and shivering. This zone is probably in the inferior portion of the pons and the middle portion of the medulla oblongata, possibly in the reticular formation. L. E. GILSON (Chem. Abstr.).

Stimulant Power of Secondary and Tertiary Phenylisopropylamines. Novelli, Armando, and Tainter, M. L. [*J. Pharmacol.*, **77**, 324–31 (1943).]

Homologs of benzedrine with one or two alkyl groups substituted on the N were studied for their effects on the central nervous system, circulation and respiration. Dimethyl-, ethyl-, diethyl-, butyl- and amyl-dl-benzedrine in moderate doses have no important action. In rats d-methylbenzedrine is slightly more active as a cerebral excitant than d-benzedrine. Respiration in animals and man is stimulated in amplitude and frequency by methylbenzedrine. d-Methylbenzedrine (pervitin) is much more active than the l-isomer. In another compound the amino group of benzedrine was replaced by piperidyl. The action of this compound was weak. L. E. GILSON (Chem. Abstr.).

Action of Adrenaline on the Atropine-acetylcholine Reversal Phenomenon. Stehle, R. L., and Melville, K. I. [*J. Pharmacol.*, **77**, 332–5 (1943).]

During slow intravenous injection of adrenaline or arterenol in the atropinized spinal cat, the pressor response to a large dose of acetylcholine is abolished and a transient depressor response is produced. During intravenous infusion of posterior pituitary extract under similar conditions the pressor response to acetylcholine is not abolished, but may be preceded by a transient depressor response when the blood pressure is high. L. E. GILSON (Chem. Abstr.).

Influence of Certain Drugs on the Crustacean Nerve-muscle System. Ellis, C. H., Thienes, C. H., and Wiersma, C. A. G. [*Biol. Bull.*, **83**, 334–52 (1942).]

The effects of a wide selection of drugs of known pharmacological action (sympathetic drugs, parasympathetic drugs, curare-like drugs, insecticides, local anesthetics and muscle drugs) were studied on the peripheral nerve-muscle preparations of the cheliped of the crayfish, *Cambarus clarkii*. The local anesthetics were the only drugs which, as a group, showed the customary vertebrate effects on crustacean preparations. In general the effects of the drugs studied were limited to changes in the excitability of the nerve fibre ; either the refractory period of the nerve was markedly lengthened, or the nerve fibers became so hypersensitive that excitatory stimuli set up multiple discharges in them. The drugs excited little effect on the mechanisms involved in peripheral inhibition, especially on those responsible for supplementary inhibition. An investigation into certain " reversal " effects in which stimulation of the inhibitory axon showed an excitation, and in which stimulation of the excitatory axon showed an inhibitory effect, indicated that the former may be ascribed to stimulation of the adjacent hypersensitive motor fiber upon stimulation of the inhibitor, and the latter to a Wedensky-block. The central effects appear to be quite different from the effects on the peripheral systems.

LAWRENCE P. MILLER (Chem. Abstr.).

Action of Prostigmine on the Chronaxie Curve after Fatigue. Bourguignon, Georges, and Morichau-Beauchant, Jean. [*Bull. acad. med.*, **124**, 615–21 (1941).]

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

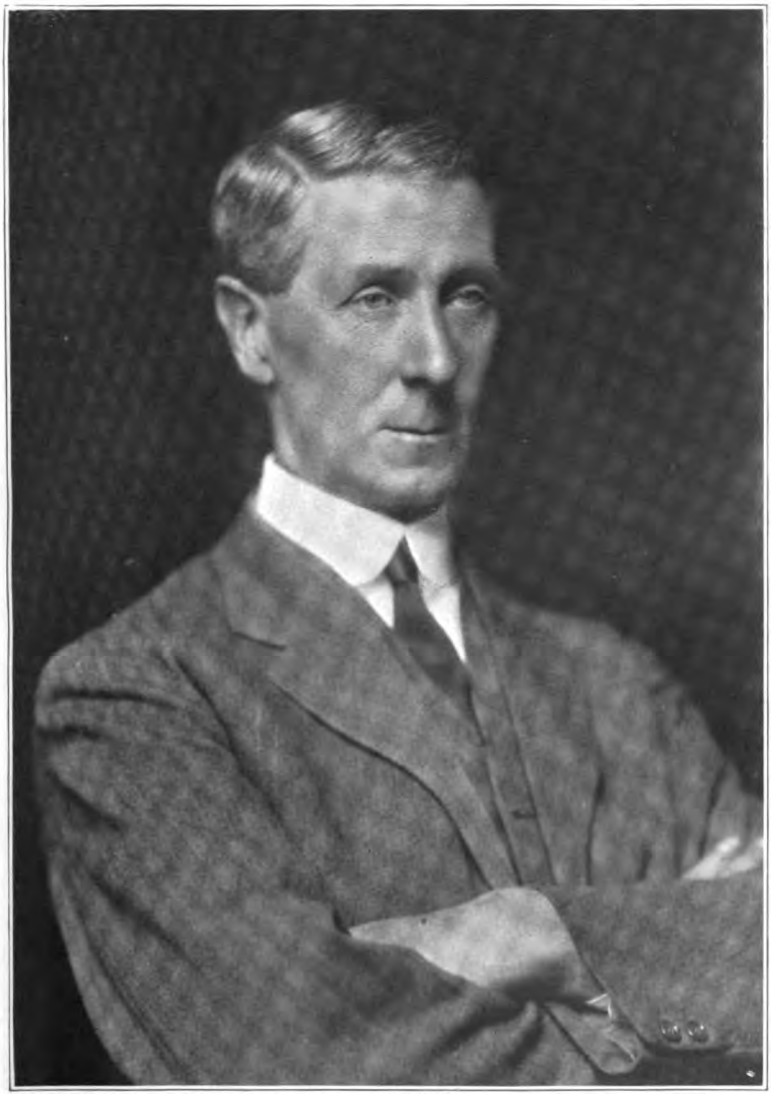
The Effect of Neurovegetative Poisons on Resistance to Injection. Frei, W. [*Schweiz. med. Wochschr.*, **71**, 377–9 (1941) ; *Chem. Zentr.*, **1**, 2293 (1942).]

Ephetonine increased resistance in mice against erysipelas infection. Acetylcholine increased resistance in the guinea-pig against infection with anthrax. Pilocarpine appeared to have a similar action. MAURICE M. RATH (Chem. Abstr.).

OBITUARY.

DOUGLAS McRAE, M.D., F.R.C.P.E.

GEORGE DOUGLAS McRAE was born on August 3, 1874, at Penicuik, Midlothian, the fourth son of Alexander Edwards McRae, M.D.Aberd., Fetteresk, Penicuik, and his wife Johanna Skinner Ranken, third daughter of the Very Revd. Arthur Ranken, Dean of Aberdeen and Orkney. Dr. Alexander McRae was descended from the " Clan " MacRae of Clunes, near Beauly, in Easter Ross and Cromarty, some of whom were also settled for a time on the west coast at Duich in Kintail at the head of Loch Duich. He died in 1882 at the age of 40, leaving his widow with a family of seven young children, four sons (another having died in 1876) and three daughters, to be brought up and educated. Owing to her husband's untimely death Mrs. McRae was not left in good circumstances; but she was a lady of strong character and striking personality, and exceptionally capable, practical and energetic, and she faced this duty and labour of love with great devotion, and for many years at Fetteresk successfully ran a comfortable and happy home for mental invalids. Her family always had the highest admiration and warmest affection for their mother, who died in 1904 at the age of 63. It is of interest to note, as an indication of his unbringing and character, that Douglas McRae in his youth was called " Sir Galahad " by his brothers and sisters in the chaff round the family table. He was educated at George Watson's College and the University of Edinburgh. He was a distinguished student, and gained medals in pathology and surgery and first-class honours certificates in medicine, midwifery, and mental diseases. He graduated M.B., C.M., in 1895. After graduation he acted for a short period as clinical assistant at Dundee Royal Infirmary, and for eight months as *locum tenens* in private practice in Devonshire and Northamptonshire. But his early home influences had particularly interested him in mental diseases, and in 1896 he decided to devote his life to that specialty. In 1896 he acted as clinical assistant at West Riding Asylum, Wakefield, and then at Royal Edinburgh Asylum, Morningside, where the writer (then an assistant physician) was one of his colleagues, and a life-long friendship began. In December, 1896, he was appointed an assistant medical officer at Wakefield, where he served under the late Dr. Bevan Lewis till May, 1899, acting also latterly as deputy pathologist and known there as " the industrious apprentice." In June, 1899, he was appointed an assistant physician at Morningside under the late Sir Thomas Clouston, and in 1902 became senior assistant physician in the West House department. During his nine years of office at Royal Edinburgh Asylum, from 1899 to 1908, he also acted as pathologist and was specially interested in pathological research. He worked assiduously in collaboration with the late Dr. William Ford Robertson, then Pathologist to the Scottish Asylums. During the five years 1903–1907 they published five joint papers on their bacteriological and experimental investigations into the pathology of general paralysis and tabes dorsalis, and on the treatment of these diseases by vaccines and antisera, having come to the conclusion that diphtheroid bacilli from the genito-urinary tract and other body passages were the specific and immediate exciting agents in the etiology of these affections, and that syphilis played only a predisposing role by lowering the resistance of the nervous system. This conclusion was disproved on the later discovery by Noguchi and others of the syphilitic spirochaete in the brain of general paretics. In 1906, while still senior assistant at West House, Douglas McRae was selected, on the special recommendation of the Commissioners in Lunacy, to act as Interim Medical Superintendent of Aberdeen City District Asylum at Kingseat, on the unexpected death of its first Superintendent, the late Dr. Charles Angus. This position he occupied for ten weeks. In 1907 he became M.D. of Edinburgh University, obtaining honours for his Thesis; and in November, 1907, after gaining the Diploma of M.R.C.P.E. in 1904, he was



DOUGLAS McRAE, M.D., F.R.C.P.E.

elected F.R.C.P.E. In January, 1908, he succeeded the writer as Medical Superintendent of Ayr District Asylum at Glengall, an office which he held with much acceptance to his Board and the community of Ayrshire during the ensuing 31 years, until his retirement in the summer of 1939.

Throughout the long tenure of his regime as medical and administrative "Chief" at Glengall Hospital he devoted himself unsparingly to his work and was a master of detail, in intimate touch with every aspect of its life and doings; and throughout he retained the highest esteem and regard of both patients and staff, and the best interests of both were constantly in the forefront of his thoughts. Conscientiousness and integrity, a high sense of duty and honour, thoughtfulness and consideration for others, kindliness and sympathy, unselfishness and generosity, willingness to help and serve others, and invariable cheerfulness, were shining facets and outstanding features of his nature and humanity. Apart from his fine record at Glengall Hospital, Douglas McRae took an active interest and prominent part in the life and affairs of the Burgh and County of Ayr. He was a Justice of the Peace for Ayrshire, and was frequently engaged as adviser and expert witness in criminal and other judicial proceedings. During the Great War, 1914–18, he acted as Chairman of Ayrshire Local War Emergency Committee; and amongst other offices at various times he was Chairman of Ayrshire Joint Welfare, Hospitals, and Maternity and Child Diseases Committees; President of the Ayrshire Division of the Glasgow and West of Scotland Branch of the British Medical Association; and President of Ayrshire Musical Festival and of Ayr Amateur Orchestra, and a Vice-President of Ayr Burgh Choir. He was a lover of music (singing, piano and violin), the hobby which probably appealed to him most intimately, and he derived special pleasure as also solace from his violin, which he played with fine taste and expression. He also enjoyed and actively participated in private theatricals, playing his parts well. His favourite outdoor recreations were shooting, fishing, golf, cricket, motoring and gardening.

Douglas McRae became a member of the Royal Medico-Psychological Association in 1901, and its affairs were one of his chief interests during the rest of his life, and to it he gave very faithful and meritorious service. He acted as Assistant Editor of the *Journal of Mental Science* from 1915 to 1920, and thereafter till 1943 as one of the Joint Editors. The Association owe him a great debt of gratitude for his careful and valuable work in this responsible office, which occupied much of his time and energy. He also served at various periods as a Scottish Representative on the Council of the Association, and was Chairman of the Scottish Division, 1931–32, and Vice-Chairman of the Educational Committee, 1933–37. His long and much appreciated services received their just and well-deserved reward when the Association conferred upon him the highest honour at its disposal and elected him President for 1937–38.

Apart from his earlier joint papers he contributed the article on "Alcoholic Insanity" in Green's *Encyclopaedia Medica*, and occasional abstracts and reviews of psychiatrical literature to various medical journals. Amongst other activities in the specialty he was also a past Chairman of the Scottish Asylums' Pathological Scheme, External Examiner in Psychological Medicine at Leeds University, and Examiner in Mental Diseases for the General Nursing Council of Scotland.

Douglas McRae was a faithful adherent and very regular attendant of the Episcopal Church of Scotland; and in politics he was a staunch Conservative. Throughout his busy life he was "the good companion," genuine and warm-hearted friend, and apart from his more serious side always cheery and fond of a joke. He had a keen sense of humour, and in discussions at medical and social meetings he often, out of mischief, expressed views (of which he himself did not approve) simply in order to arouse argument and ginger up opposition. He had another and allied streak in his nature, perhaps deriving from his Highland ancestry, a strong spirit of independence and readiness to resist what he regarded as any encroachment on one's rights and freedom. To be "hadden doon" in this way was anathema to him, and especially when such "encroachments" arrived in the form of circulars of instructions from the General Board of Control; and his antagonistic attitude to such perhaps did not always operate in the direction of his own best interests. But "Fighting Mac," as some of us dubbed him, was at bottom a peaceable and law-abiding member of society, and much endeared to all who knew him intimately.

After his retirement from Glengall Hospital in 1939 shortly before the outbreak of the present World War he settled at Duich, West Linton, Peeblesshire, about nine miles to the south-west of his native Penicuik. Here he made his last home and spent much of his leisure at the call of his garden; and he soon became a well-known figure in the village and, owing to his friendly and cheery nature, much liked by all and simply adored by the children. Gradually, however, his health broke down and cardiac weakness set in, and finally he passed away peacefully on May 7, 1943, in his 69th year. His mortal remains rest in the family grave in the old churchyard at Penicuik, overlooking the murmuring Esk and the little town with its distant sounds of a busy industry.

Douglas McRae married in 1908 Violet Moore Clouston, youngest daughter of the late James Stewart Clouston, Chief Factor of the Hudson Bay Company, and Margaret Miles. (He came of an old Orcadian family and left Orkney for Canada at the age of 17, and his eldest son was the late Sir Edward Seabourne Clouston, Baronet, President of the Bank of Montreal.) Douglas McRae is survived by his widow and their two children, Elizabeth, who resides with her mother, and Douglas Arthur, who is a Major in the R.A.M.C., and at present serving with the Central Mediterranean Force in Italy. To them we tender our deep sympathy in their great loss and sorrow.

C. C. EASTERBROOK.

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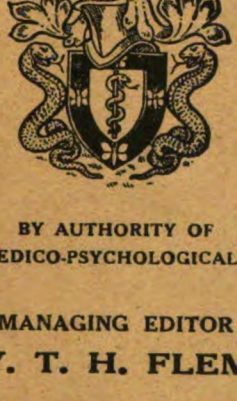

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Part I.—Original Articles.

A STUDY OF THE HISTOLOGY OF THE TESTIS IN SCHIZOPHRENIA AND OTHER MENTAL DISORDERS.

By R. E. HEMPHILL, M.A., M.D., D.P.M.,
Medical Superintendent, Bristol Mental Hospital;
M. REISS, M.D., D.Sc.Prague,
Director of the Endocrinological Department, Burden Neurological Institute; and
A. L. TAYLOR, M.D.,
Hon. Pathologist and Director of Clinical Laboratories, Bristol General Hospital.

(Received April 18, 1944.)

SYMPTOMS attributed to dysfunction of the ductless glands have long been noticed in the group of mental disorders formerly known as dementia praecox, now included in the wider designation schizophrenia. A variety of such abnormalities has been described, but without sufficient consistency or clarity to help in formulating a pathology of the disorder. From the first, the usual onset in adolescence or early adulthood, and the symptomatology, prompted investigation of the gonads. Papers have been published by Fränkel (1919), Mott (1919), Pézard (1920), Tiffany (1921), Lewis (1923), Morse (1923), Geller (1923), Münzer (1926), McCartney (1929), in which histological changes in the testis in schizophrenia are cited and discussed. The contributions of Mott, Lewis and Morse are the most important, for their material and histology are more accurately controlled and described. It appeared as if the very extensive work done by Mott had succeeded in establishing a direct relationship between gonadal failure and dementia praecox. Subsequently his findings were heavily criticised and the conclusions to a great extent rejected, for, like others, he had obtained material at post mortem, mostly from patients who had died of tuberculosis or other diseases liable to produce the very changes he regarded as specific; very few were young adults in the early phases of the mental disease. These objections constituted an apparently insuperable difficulty, and the whole question has remained virtually in abeyance ever since.

Testicular biopsy, employed by Lane Roberts *et al.* (1939), Charny (1940), in urology, allowed a new approach. By this simple operation, small pieces of testis adequate for histological examination can be obtained from patients selected for good bodily health, and in characteristic forms, phases and durations of the mental illness. Bioptic examinations were made by us in a representative series from various psychoses as well as schizophrenia. Except in special examples referred to in the text, all patients were well nourished and in good bodily health, diets were standard, there was little possibility of avitaminosis. The histological investigations will be described here; clinical correlations and implications will be presented in a subsequent paper.

METHOD.

The following technique was adopted as standard : After the usual pre-operative preparation, the skin of the scrotum over the middle of the lateral aspect of the larger testis is infiltrated with percaine (Ciba) for about 2 cm. An assistant supports the testis, being careful not to exert pressure sufficient to cause venous obstruction. The skin is incised and the various layers of the tunica vaginalis divided between forceps. The escape of a small quantity of fluid signifies that the sac has been opened. The shining tunica albuginea is incised for about 0·5 cm., at right angles to the long axis of the globe, avoiding visible vessels. Slight pressure on the testis at this moment causes a knuckle of tissue to protrude. This is snipped off with very sharp iridectomy scissors and transferred on the point, so as to avoid squeezing with a forceps, directly into Bouin's solution. The skin is closed with one catgut suture and sealed with collodion. The patient wears a suspensory bandage and, if convenient, remains in bed for two or three days. Morphia, gr. ¼, and paraldehyde, drm. ij, by mouth are routine premedication in mental patients. The operation is only possible under local anaesthetic if patients do not resist, and consequently must be conducted very gently. The testis clamp advocated by Schlossmann (1943) must cause venous and lymphatic congestion, and so may alter the histological picture.

The tissue removed is fixed for two days in Bouin's solution—Zenker's solution and 10 per cent. formalin are both inferior—and after careful washing, blocked in paraffin. Sections are cut at 5μ and stained with standard Delafield's haematoxylin and eosin ; Mallory's orange G, Masson's trichrome and Van Gieson's stains are used for examination of fibrous and connective tissues and vessels. Formalin fixed frozen sections stained for lipoids proved quite unsatisfactory and, after an initial trial, were not used subsequently. With this technique and precautions uniform sections were obtained, so that the normal and pathological features could be compared in the whole series. In a few cases biopsies were performed on both testes, similar pictures being observed in each. We have found in agreement with Charny (1942) that the bioptic method gives specimens fairly representative of the condition of the whole testis ; it has been reliably used experimentally in larger animals (Smith, 1938). Cellular and structural detail are much better preserved in fresh than post-mortem tissue, in which there is a tendency to shrink so that the inter-tubular spaces are exaggerated and the tubules may look smaller (Fig. 1).

MATERIAL.

The specimens were obtained from 90 cases of schizophrenia and 25 others, namely, mania 3, depression 3, involutional melancholia 2, neuroses 4, alcoholism 4, syphilis 2, mental defect 6, organic brain disease 1. There are comparatively few cases of mania or depression, for most of these improve rapidly, and it was felt unjustifiable to seek consent for operation in patients likely to recover quickly unless testis changes could be anticipated and a sufficient number of young subjects in good bodily health could be obtained for study. These conditions cannot be easily fulfilled in the manic-depressive psychosis and other mental illnesses commoner in middle or late life.

As will be seen, the indications are that causally related pathological changes in the testis do not occur in mental disease other than schizophrenia, in the absence of organic disorder. This is in keeping with the findings of Mott, who noted that the testes obtained at post mortem from about 70 non-schizophrenic cases, excluding syphilis and senile states, were comparatively normal. Of the schizophrenic group in our material, apart from three, no cases have been included in which there was evidence at the time of operation of malnutrition, active physical illness or history of tuberculosis, and no patient has been accepted with gross gonadal defects, such as obvious hydrocele or incompletely descended testis. The pathological specimens were numbered and studied without knowledge of their source, in order to avoid possible prejudice. An objective report was made from each in which the histology in general and the state of particular components were described irrespective of the age or clinical diagnosis, which as far as possible were not known at the time.

When specimens from 50 different patients had been examined it was seen that severe pathological changes were present in many; others were less or not at all

affected. The reports were then classified in five groups according to the degree of departure from what was regarded as normal. Some slight adjustment was made later in the light of further experience, and less emphasis laid on certain features, such as intertubular oedema, which had appeared to be of significance in the earlier stages of the investigation.

As a basis for any classification it is essential to establish criteria for what constitutes the normal testis. This is fairly constant for individuals of similar species, age and endocrine state in lower animals. But in man this is not the case. The so-called normal testis is obtained at post-mortem or operation and, apart from the effects of the morbid process, may contain areas of destroyed or damaged elements that are possibly attributable to old age, trauma or intercurrent disease. Nevertheless, in other respects it may be functionally active.

The literature relating to the anatomy and pathology of the human testis prior to 1930 has been well discussed by Stieve (1930). Up to this date there was a tendency to regard what may be called the " textbook " testis as what was commonly to be expected at post mortem in adults free from tumour or local disease. The later investigation of Sand and Okkels (1936, 1937) and others on testes obtained by legal castration or accidental death have shown that the absolute normal is very rarely encountered in mature adult life.

In the normal " classical " testis of adults, tubules whose walls are formed of layers of connective tissue, of which the innermost supports the basement membrane, enclose the regularly arranged seminiferous epithelium and the less obvious Sertoli cells and their processes. The tubules are tightly packed, and where maturation is complete may show lumina containing mature spermatozoa. Elsewhere less mature but actively developing cells fill the tubules, which are seen cut in cross- or oblique section in a relatively loose stroma. In the stroma are various interstitial cells and vessels with groups of Leydig's cells close, but not necessarily related (Rasmussen, 1928) (Figs. 1 and 2).

This picture is rarely seen to perfection in post-mortem tissues. Kyrle (1920) in 1,000 cases saw not one entirely normal testis ; Branca (1911), Schinz and Slotopolsky (1924), Romeis (1926) found much the same. Stieve (1930) agreed, but noticed no sign of degeneration in men between 16 and 25 who had suffered accidental death, although spermatogenesis was often unequal in the tubules. Maximow and Bloom (1942) consider that small areas of atrophic tubules are not uncommon after 35 in the normally functioning testis. Koopman (1936) examined testes from castrated sex criminals. Like many other authors, he made no allowance for age or psychiatric diagnosis. Of 69 cases all testes were within a " normal " range and none were non-functioning. He supposed that the small areas of atrophy found in some may have been related to inflammatory or vascular processes, and were more extensive and more frequently seen with increasing age. Testes from 125 sex criminals of another series were " normal " (Rossle, 1935). According to Teem (1935), studying 504 post-mortem cases, a remarkably active state of spermatogenesis is frequently seen as late in life as 40 and 69 years. Sand and Okkels (1936) found 8 completely and 12 nearly normal testes in a selected group of 34 between 20 and 71 years ; the remainder were outside normal range. Somewhat similar findings were noted in castrated sex criminals between 20 and 66 years, of average age 39. In a further paper Sand and Okkels (1937) describe an entirely normal histology in 17 out of 72 castrated and sudden death specimens, mostly in the fourth decade.

A fair summary of all these important papers would suggest that up to 25 years of age, with normal bodily health free from endocrine abnormality, the testis should be functionally active and without atrophic processes. From 25 to 35 atrophic areas may be encountered, and from 35 to 66 these will be seen more frequently ; there should be fairly active spermatogenesis in most tubules, decreasing with advancing years.

In assessing the degree of normality of the testis the state of spermatogenesis as well as the presence of pathological processes must be evaluated. The former, irrespective of age, must be considered the more important, for the value of a testis as an organ depends on its functional possibilities ; these need not be significantly impaired by local areas of atrophy. Pathological changes in a study of the sort undertaken here must be regarded as of secondary importance, unless they produce widespread interference with the organ and are characteristic of the state of the

testis tissue as a whole. Too little is known about the regulation of the internal secretion of the human testis to allow conclusions to be drawn from the histological inspection of a small piece. So although the state of the Leydig cells has been recorded, no attempt has been made to estimate their functional value.

To meet the difficulties and requirements the material was classified as follows: *Group I:* Entirely normal, or free from pathological changes and showing active spermatogenesis (Fig. 2). *Group II:* Active spermatogenesis in the majority of tubules with small and apparently unimportant pathological areas (Fig. 3). *Groups III* and *IV:* Showing increasingly severe degrees of impairment, with defective spermatogenesis and other important pathological features shortly to be detailed (Figs. 4, 5). *Group V:* The severest grade of defect, includes the entirely functionless testes in which no normal spermatozoa were seen in any tubule and in which widespread atrophic areas were apparent (Fig. 6). Thus in certain cases in Group IV almost no normal spermatogenesis was seen, but pathological changes were not extreme (Fig. 5); in others, in Group III, while pathological features were marked, spermatogenesis was moderate in some tubules (Fig. 6). In every case the functional importance of the testis has been emphasized, and if anything the significance of pathological change has been underrated. It is probable that Group II contains examples which are abnormal for the age, if under 25 years, but, on the whole, Groups I and II may be considered to be within normal limits. Although a proportion of Group III would be probably within the normal range if allowance were made for the greater age, it is not possible to regard any case of Group IV or V as approaching normality. The distribution of the case-material among the types of mental disorders will be seen in the table, which shows that the great majority of cases making up Groups IV and V are of schizophrenia. In general these are younger than the other mental types. Their extremes of age being between 15 and 43, all the youngest subjects of any mental illness in Groups IV and V suffered from schizophrenia. The other psychoses ranged in age between 18 and 56 years, and the oldest of all patients are to be found in Group III. If adjustment were made for increasing years it would operate more favourably for the non-schizophrenic psychoses.

When it is seen that apart from one chronic alcoholic and two cases of syphilis, the remaining 22 out of 25 specimens from non-schizophrenic patients are in Grades I, II and III, and that more than half of those from schizophrenics are in IV and V, a considerable difference in the pathology of the testis in these two mental groups will be anticipated. This is, in fact, so, and there are marked differences between the schizophrenic testis and those of other conditions. It will be convenient to consider first the changes in the component parts, and later piece them together to obtain as far as possible a picture of the whole pathological process.

Histological Criteria.

(1) *Changes in Intra-tubular Epithelium.*

Abnormal spermatogenesis may occur with or without noticeable alteration of the tubular capsule. Although both coexist in many of the specimens from schizophrenics, capsular changes were exceptional in the non-schizophrenic group. These appearances may be considered as:

(a) *Breaking up of intra-tubular elements.*—Fragility of the contents of the tubules, with, in the lumina, debris and fragmented cell tissue which tended to stain poorly, was commonly seen in many cases of all groups. According to Maximow and Bloom (1942) this should not be regarded as abnormal unless extensive. Clumps and "balls" of debris and shedding of immature cells into the lumen is always pathological according to Stieve (1930). This picture was regarded as indicating a local condition unless many tubules were affected, and in such cases there were usually evidences of more serious damage elsewhere.

(b) *Falling out of tubular centres.*—A complete arrest of spermatogenesis at any stage of maturation produces an appearance as if the centres of the tubules have dropped out, so that all cellular elements and Sertoli network are lost. The intratubular structures seem to become fragile, break away and pass into the lumina. Although frequently observed in a few tubules it was extreme in only two cases (Figs. 7, 8). Both suffered from schizophrenia, but in addition one developed acute miliary tuberculosis and died shortly after biopsy, while the other had been

refusing food and was undernourished. A photomicrograph almost identical with Fig. 7 of a single case published by Stieve (1930) represents changes in the testis of a healthy adult who committed suicide after 16 days' privation when pursued by the police. The tendency to disintegration of all elements is not characteristic of the usual causes of atrophy, e.g. heat, X-ray, etc., where the more resistant Sertoli network is well preserved, and it gives the impression of being an acute process, for shrinkage or collapse such as occurs when hyalinized tubules lose their contents has not taken place. The view that this is an artefact, the intratubular material having dropped out in fixation, may be set aside, for, as seen in Figs. 8 and 9, the lumina may contain a colloid-like substance, which stains pinkish violet with Mallory's orange G. This form of degeneration is probably the result of an acute change in intratubular elements and not secondary to affection of the tubular capsule. Both these special cases have been included in the series, because in some of their tubules the more characteristic changes associated with schizophrenia were seen.

(c) *Reduced spermatogenesis.*—A relative inactivity of sperm formation was the chief defect in non-schizophrenic and non-organic cases. This could be judged only by comparison with the most active specimens, and by itself did not condemn any to a lower grade than II. In older patients, over 40, there was as a rule a noticeable quantitative reduction of seminiferous epithelium, although what was seen appeared to be in adequate activity. The Sertoli cells were better preserved and with some disappearance of seminiferous epithelium became more obvious. The testis of a chronic alcoholic in the sixth decade was well equipped and appeared remarkably active (Fig. 10).

(2) *Tubular Changes Associated with Alterations of the Tubule Capsules.*

(a) "*Cart-wheels.*"—This appearance is produced by the combination of severe loss of seminiferous cells and prominence of Sertoli cells and their processes. The Sertoli processes radiate from a hub composed of poorly staining degenerate or immature cells in the centre of a tubule that is without patent lumen (Figs. 11, 12). They are prominent and seem often to be thickened, and in a state of activity in contrast with the seminiferous cells (Fig. 12).

Peripherally they are in close relation with the basement membrane. Between the " spokes " of the wheel are seminiferous cells, relatively few in number and inactive. No mature forms are seen, and even the spermatogonia may be defective in number and show few mitoses. This picture resembles the atrophy that has been demonstrated in animals as the result of heat, malposition of the testis and noxious agents, and in certain human cases, in which the more mature germinal forms suffer most but the hardier Sertoli cells survive. The vacuole formation described by Charny (1942) is similar, and produced by gaps in the syncitial background due to loss of cells.

It was noted that the capsule was usually thicker than normal in the " cart-wheel " tubule and consisted of layers, somewhat separated and split; it often presented a wavy appearance. In the great majority of specimens showing this form, damaged tubules with hyalinized capsules were also present. Although the basement membrane was usually thicker than normal, the hyaline change, now to be described, was not seen in the well developed " cart-wheels."

(b) *Tubular atrophy with hyalinization of the capsule.*—In almost all the more seriously damaged testes, as well as in some of class 2 of the schizophrenic group a characteristic finding regardless of age was hyaline degeneration of the capsule. It was observed that inside tubules so affected the cells, seminiferous and Sertoli alike, lost their distinct morphology and tended to become one mass of indeterminate structure that stained rather heavily but without any clear definition. Although mitotic figures were observed, mature sperm forms were not seen, and the appearance was that of degenerating cells (Fig. 13). Many specimens showed tubules affected in varying degree, and it was therefore possible to study the development of the germinal atrophy and the process of hyalinization.

All the evidence is that the intratubular change is secondary to the hyalinization. Some tubules were seen in which nearly normal spermatogenesis was proceeding in spite of a little alteration of the capsule, but in every tubule in which the hyalinization reached a certain extent, the germinal cell degeneration occurred. Thereafter the result seemed to be always the same. The thickened layer of the

capsule encroached on the interior of the tubule; normal spermatogenesis ceased, and as soon as the basement membrane reached a certain thickness the contained cell mass became detached and passed freely into the interior of the tubule. The hyaline shell later collapsed, and the tubule was represented by a slit or a mass of hyaline material between the surviving tubules. The site of primary change can be stated with certainty to be the basement membrane. This structure is barely visible in the normal active testis of early adult life. It becomes thicker and somewhat more obvious at 40 to 45 years (Stieve, 1930). That it is not necessarily affected by malnutrition and by the usual causes of testis atrophy is well demonstrated by Case A. F— (Fig. 14). Here it may be seen as a thin band in close relation to the seminiferous epithelium and Sertoli cells, lying internal to the flattened nuclei of the lamellated connective tissue that forms the outer supporting wall of the tubule. This patient died of terminal broncho-pneumonia, superimposed on Alzheimer's pre-senile cerebral atrophy. His illness had been protracted, and for some months before death he was grossly emaciated.

We have found it convenient for purposes of classification to assess the course of the morbid process in five grades of increasing severity:

First stage.—In Fig. 15, depicting a normal tubule in active spermatogenesis, the basement membrane can only just be discerned. In the first stage of change it becomes more clearly defined; for a while spermatogenesis may proceed satisfactorily (Fig. 16).

Second stage.—The basement membrane appears definitely thickened by comparison with the normally thicker outer layer; spermatogenesis is affected, the intra-tubular elements lose their clarity and fuse into a rather amorphous mass in which some cells are still in mitosis. By contrast with the tubular atrophy of testis injury or bodily disease all elements are disorganized, the primitive germ cells and Sertoli cells are not specially preserved, the seminiferous epithelium losing its architectural arrangement (Fig. 17).

Third stage.—With further thickening, now well marked even at low magnifications, the degeneration proceeds and the tubule shrinks in size (Fig. 18). At this third stage the contents break away from the basement membrane, and the tubule collapses as the walls approximate (Fig. 19). In Fig. 20 (the same case as Fig. 15) at high magnification the epithelium can be seen closely related and attached to the basement membrane. By contrast, in Fig. 21 (same case as Fig. 18) the enormously thickened hyalinized membrane projects into the lumen of a tubule in folds to which the degenerated epithelium is no longer attached. The hyalinized portion has already exceeded in width the outer layers of the capsule. Detachment of the epithelium precedes collapse, as empty but patent tubules often occur; shrinkage is not entirely responsible, for tubules which would be of normal size if full are frequently seen in process of emptying.

Fourth stage.—The empty tubules may remain as incompletely closed slits, empty or containing a little debris (Fig. 22). Spermatozoa and other cells from unaffected parts of the tubule distal to the destroyed area are never seen, so it appears as if the lumen is blocked or spermatogenesis has ceased beyond this point.

Fifth stage.—In the last stage the hyalinized walls tend to fuse, and all that is left is a mass in which the faint outlines of the original tubule can sometimes be recognized (Fig. 23). The outer layers of the capsule never become hyalinized, and there is no hyperplasia or fibrosis of the interstitial stroma. The end-result in advanced cases is a destroyed testis containing tubules in every stage of atrophy in a non-fibrous stroma with, in places, areas of amorphous hyaline material (Fig. 24).

The hyalinization has certain peculiarities. It is patchy and not necessarily continuous throughout the entire length of the tubule. This is well seen in Fig. 25, showing a tubule in the first stage; one portion in the wall shows the grey line of change, but elsewhere the capsule is healthy. In spite of the small size of the biopsy material serial sections tend to confirm that the process is patchy. The degeneration is progressive, for in severe or long-standing cases longitudinal sections show it throughout (Fig. 24). It cannot be ascertained how many tubules are similarly affected without investigating the whole testis, for no doubt several sections of the same tubule cut through different loops are seen in the biopsy specimen. In many specimens cross-sections showing the greatest damage are grouped together so that they probably represent extensive change for a great length of the same tubule. No reason for the local predilection was apparent.

The hyalinized membrane stains silvery grey with haematoxylin-eosin, dense blue with Mallory's orange G, pinkish red with Van Gieson's. Externally it is in the main smooth, being limited by the unaffected outer layer, but centrally it has a wavy form and projects towards the centre of the tubule. Yet, even in destroyed tubules, the boundaries of the membrane, both external and central, are retained, and the internal outline can always be identified by a thin dark line (Fig. 21). Detached portions of hyaline material are never seen in the lumina. When the hyalinizing process has reached a certain development it is arrested, for there is an apparent limit to the size the basement membrane can attain, which was much the same for all tubules, and fusion of the walls only takes place long after complete tubular collapse. This suggests that the pathological process invariably attacks a basement membrane of normal size which has not been subjected to some earlier disturbance or fibrosis.

The hyalinization, in effect only a histological appearance, must represent chemical changes occurring in the basement membrane. As grave degeneration of all intra-tubular contents is seen in the second stage of hyalinization, before encroachment on the internal volume of the tubule can be great, it will be noted that a much better state of spermatogenesis often exists in more contracted tubules where Sertoli cells are better presented. These changes must be due not to the mechanical effect of pressure, but to interference with the nutrition of the epithelium, an effect which, if prolonged, is fatal to all elements, Sertoli cells included. It is felt justifiable to regard the affection of the basement membrane as the primary tubular factor in this form of atrophy, and characteristic of the degenerated testis of schizophrenia.

This degeneration is not an isolated phenomenon seen in an otherwise healthy testis. In most of the schizophrenic material hyalinized tubules were accompanied by the other forms of atrophy in varying degree, but more especially the cart-wheel type, and no really active and seemingly normal specimen of any group contained many severely hyalinized areas. This suggests either that one pathological process affects tubules in different ways, that the non-hyalinized atrophy is secondary to, or primary for, the hyaline type, or that independent pathological processes coexist. The second, or a combination of the first and second, suggestions are the most feasible. It has been shown that the hyaline change does not necessarily involve the entire length of any one tubule, rather that it is patchy and distributed irregularly. Considering the great length and many loops of each tubule, a patchy change which leads to obstruction of the lumen with degenerated cell material and eventual collapse and obliteration must, where it is on the proximal side of areas as yet unaffected, cause blocking of their outlet, with back-pressure. Any one field might show sections of loops on the proximal side of affected areas possibly in normal condition and activity, as well as those hyalinized, and others distal with obstructed outlet. It seems likely that atrophy of seminiferous epithelium, with preservation of the Sertoli network, can result from obstruction of this sort as, according to some workers, follows tying the vas deferens. But an additional factor, possibly endocrine, may have to operate as well as back-pressure, to prevent the regeneration of seminiferous epithelium which occurs after experimental closure of the excurrent ducts in animals (Moore, 1938). This explanation is consistent with the observed facts.

(c) *Other changes of the capsule.*—Thickening of the outer layers of the capsule amounting to peritubular fibrosis, in which these layers blend with the connective tissue of the interstitial spaces, was not uncommon in the older patients and where the atrophy was of some years' duration. On the whole, however, it was not in proportion to the degree of atrophy, and in many cases the end-result was a shrunken mass of tubules in every stage of atrophy surrounded by a loose or oedematous stroma, with little increase in intra-tubular connective tissue. In the syphilitic and in one of the alcoholic cases there was a marked increase of peritubular fibrosis, so that the capsules blended with a dense fibrous stroma that bound them together. In all atrophic testes, irrespective of the cause, the average size of the tubules was small.

Capsules split into layers with a wavy outline, which we have called "crenellation," are not necessarily pathological. This appearance is caused by irregular shrinkage of the circular coats so that the layers become separated and distorted. It is more marked when for any reason, such as normal emptying or loss of cells,

the contents of the tubules are reduced. It is therefore not seen where hyalinization of basement membrane encroaches on the internal volume and presumably increases the intra-tubular pressure.

(3) *Interstitial Tissues.*

(a) *Stroma.*—A colloid-like material, which stained with eosin and pinkish violet with Mallory's orange G, was commonly found between the tubules in many cases, irrespective of the grade of testis or clinical diagnosis. This has been described by other observers as oedema, a name that has therefore been retained in this paper. At first in agreement with them it was regarded as pathological, but it appeared so frequently even in testes of the highest grade that this is evidently an overstatement. It was however most noticeable where tubules were small and where atrophy without peri-tubular fibrosis had taken place. Here it appeared to be compensatory to the reduced tubular volume.

Many papers have described a compensatory increase in interstitial cells, and even hyperplasia of Leydig's cells in areas of tubular atrophy. This was not seen in the majority of the schizophrenic testes and is therefore a point of difference, especially as in non-schizophrenic organic atrophy, e.g. from syphilis or alcoholism of long standing, there was a marked interstitial reaction. In many chronic testes of Grade V the interstitial as well as the tubular tissue was much shrunken, and neither fibrosis nor oedema were much in evidence. It is probably safe to regard the interstitial oedema as space-filling in response to immediate changes in tubule volume, physiological or atrophic, but temporary, and apt to disappear as the testis shrinks or becomes fibrosed, or conceivably if the tubules regain size. It is certainly not due to trauma as suggested by Wangensteen (1927).

(b) *Leydig's cells.*—Their presence has been noted. It was felt unjustified to try to estimate their functional state from the histology. Masses of these cells are found scattered in the interstitial tissue of the normal testis, and their absence from a small biopsy specimen is not evidence that they are reduced in the slightest. No deprivation results follow unilateral castration, and probably the internal secretion is adequately supplied in adults so long as a fraction of the total secreting cells persists. Even examining the whole testis Sand and Okkels (1936) were unable to find quantitative measurements of Leydig's cells of value. Estimation of the excretion of androgens as 17-ketosteroids, which in healthy male adults are derived from adrenal cortex and gonads, at least 9 and 5 mgm. respectively from each (Fraser *et al.*, 1941) showed that a very high or very low output was not necessarily associated with presence or absence of Leydig's cells in the biopsy specimens in our cases, irrespective of the morphology. Thus it is clear that histological examination of Leydig's cells by the ordinary staining methods used in this study can tell nothing of their functional state. Secondary sex characteristics were not abnormal in any of the patients, so presumably their maintenance was supplied by an adequate internal secretion.

(c) *Vessels.*—In a high proportion of the schizophrenic material there was a marked thickening of the blood vessels, particularly those of smaller size. The lumina were much reduced, and the walls stained a dense blue with Mallory's orange G and red with Van Gieson's stain (Figs. 26, 27). No bodily disorder was found to be responsible in any case; hypertension and urinary disturbances were not present. This type of vascular sclerosis was found in many schizophrenics of all ages, including some of the youngest, but not in other cases of uncomplicated mental illness. The possibility that the tubular atrophy was secondary to vascular sclerosis was considered and rejected, as in some specimens the two processes did not co-exist, for healthy tubules were occasionally associated with sclerosed vessels, and satisfactory tubular conditions were found in several of the older non-schizophrenic testes in spite of vascular changes. This abnormality is to be regarded as part of the pathology of some forms of schizophrenia, and in keeping with the vascular anomalies commonly observed in this disease.

Macroscopic Features.

It is of interest to note here the varying macroscopic features met with at biopsy. They corresponded significantly with the microscopic picture subsequently portrayed.

The testes of many patients when the scrotum was opened were found to be

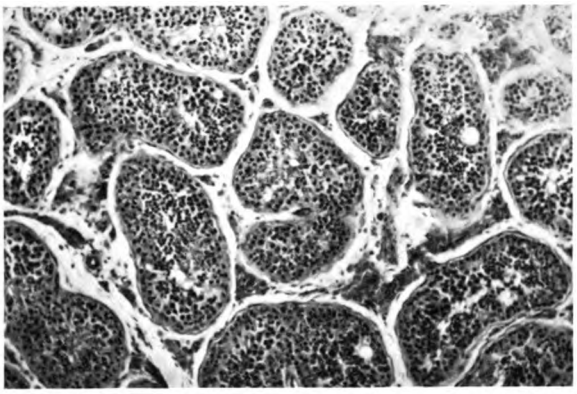

FIG. 1.—Non-mental, aged 39. Post-mortem normal. Well filled tubules; thin capsules; normal Leydig's cells. × 100.

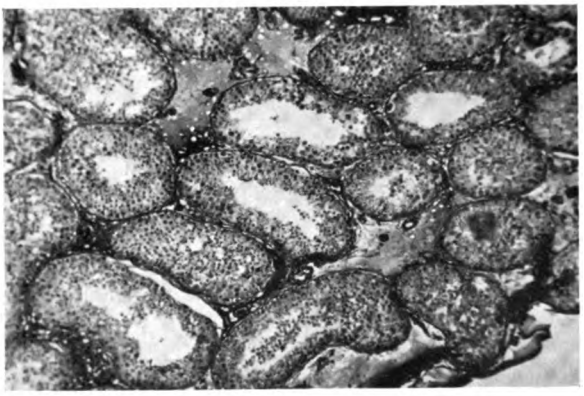

FIG. 2.—Early paranoid, aged 25. No. 110. Normal active spermatogenesis; thin capsule; intertubular oedema. × 80.

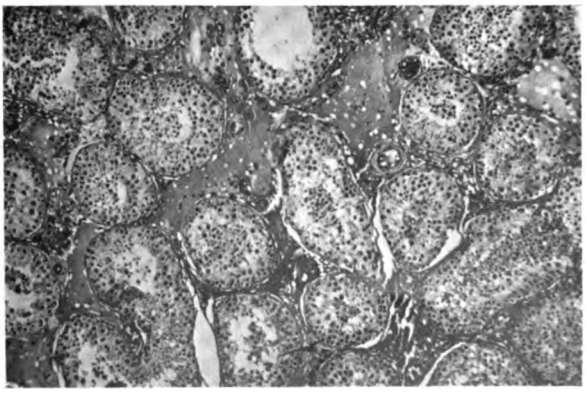

FIG. 3.—Paranoid, aged 32. No. 39. Grade II. × 80.

Note.—The arrow on certain figures indicates the basement membrane.

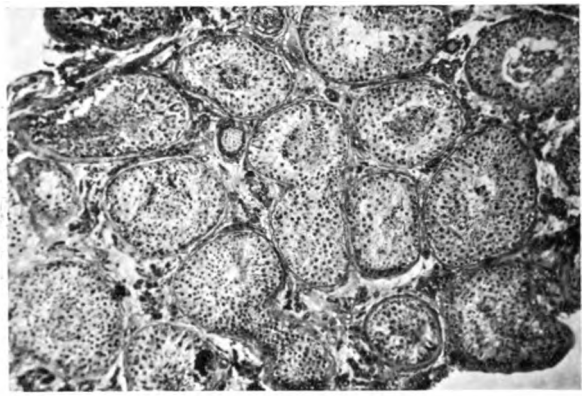

FIG. 4.—Early schizophrenic, aged 24. No. 96. Grade III. Capsular thickening; some "cart-wheels"; fair spermatogenesis. × 80.

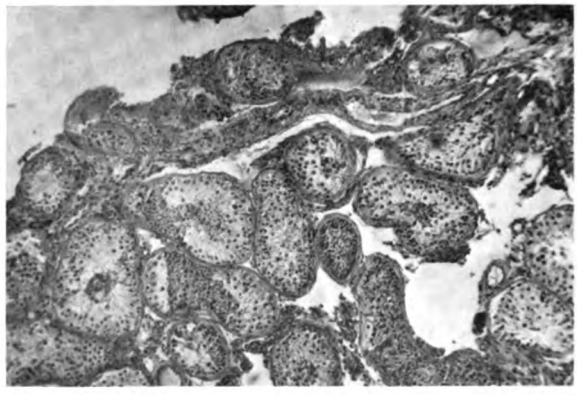

FIG. 5.—Chronic deteriorated schizophrenic, aged 36. No. 12. Grade IV. Capsular thickening showing hyalinized tubules, a few well filled. × 80.

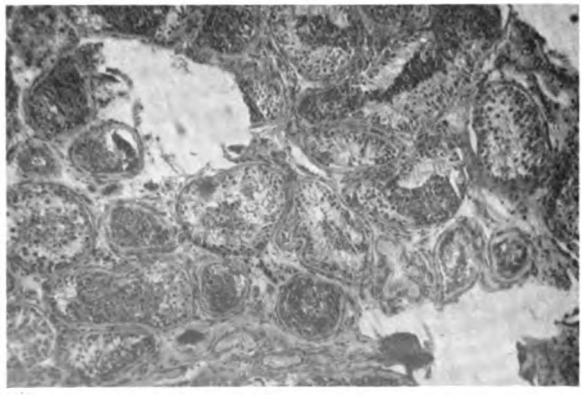

FIG. 6.—Chronic deteriorated schizophrenic, aged 17. No. 15. Grade V. Shrunken atrophied tubules. Hyalinized masses. Hyaline changes basement membrane. × 80.

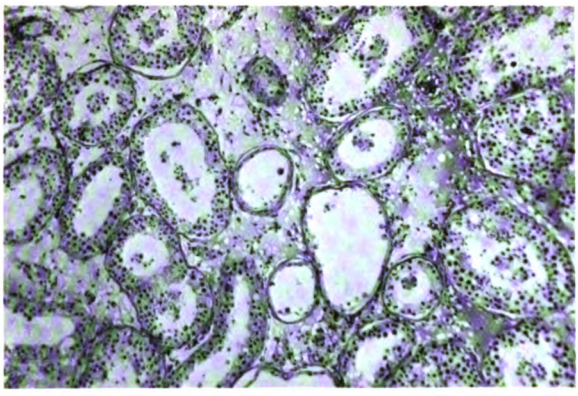

FIG. 7.—Early acute catatonic schizophrenic, aged 25. No. 32. Grade V. Showing "falling-out" of centres; all types of cells breaking away; fragility of epithelium. × 80.

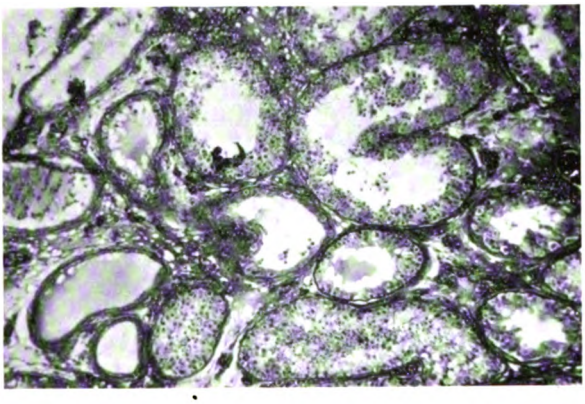

FIG. 8.—Mixed schizophrenic, early, aged 19. No. 104. Grade III. Showing "falling-out" of centres. Note colloid in empty lumina; stained Mallory's orange G. × 80.

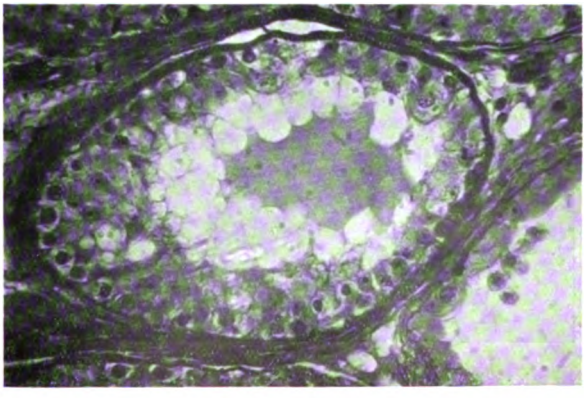

FIG. 9.—Tubule from Fig. 8. No. 104. Stained Mallory's orange G. × 330.

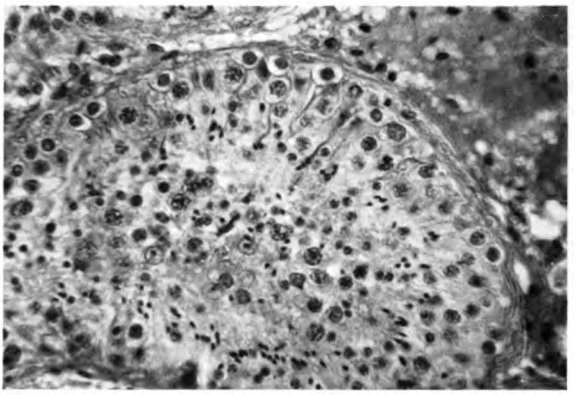

FIG. 10.—Tubule from chronic alcoholic, aged 56. Note regular architecture of epithelium with thin basement membrane. × 420.

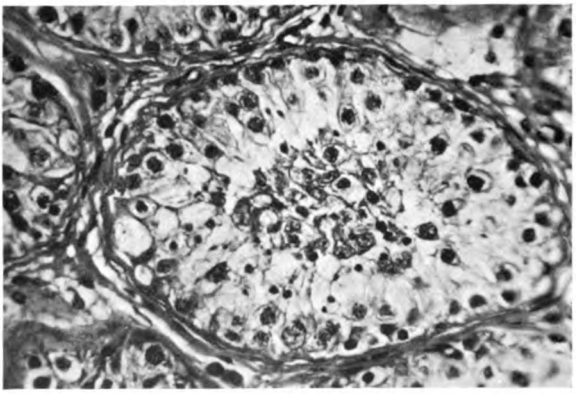

FIG. 11.—Chronic catatonic schizophrenic, aged 29. No. 43. Grade V. "Cartwheels." Note loss of spermatogenetic cells with preservation of Sertoli structure; slightly thickened basement membrane. × 330.

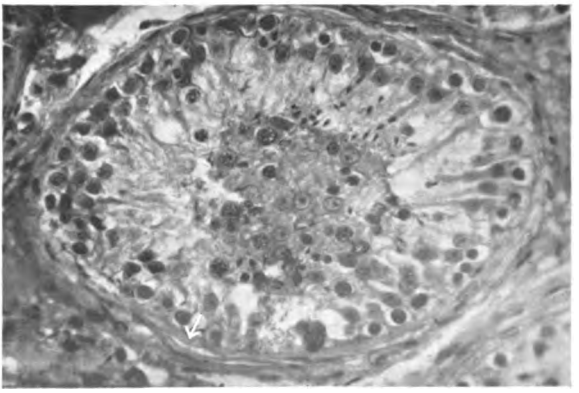

FIG. 12.—Early schizophrenic, aged 24. No. 98. Grade V. "Cartwheel." Note debris in centre, prominent Sertoli structure, some activity and stage 2 thickening of basement membrane. × 330.

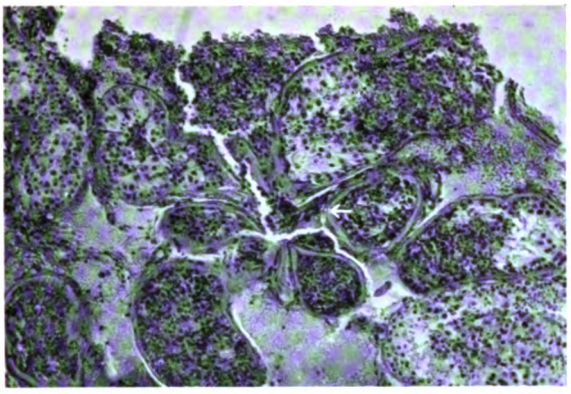

FIG. 13.—Mild chronic schizophrenic, aged 34. No. 54. Grade III. Showing shrinkage of tubules and atrophy with hyalinization of basement membrane, mostly third stage. × 80.

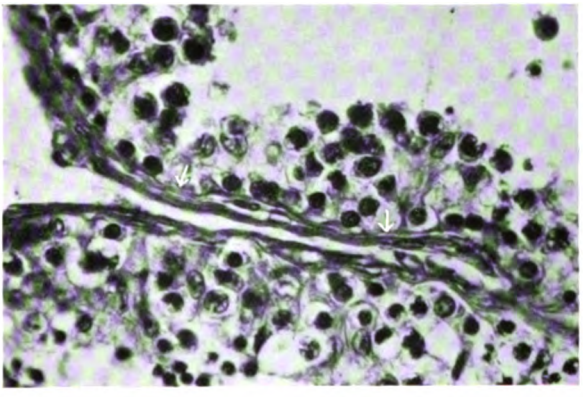

FIG. 14.—Post-mortem specimen from emaciated non-schizophrenic, aged 49, showing slightly thickened basement membrane narrower than lamellated outer capsular layer. Note well preserved architecture of seminiferous epithelium. × 420.

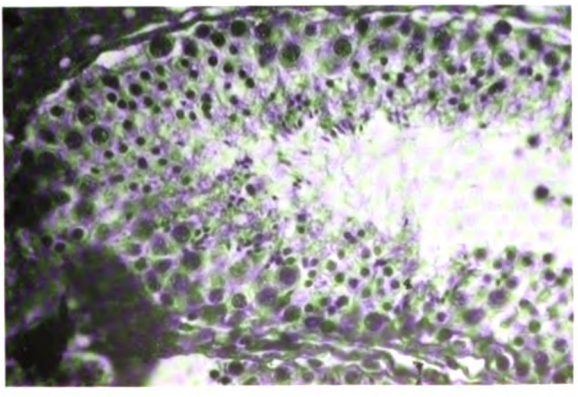

FIG. 15.—Early paranoid, aged 25. No. 110. Grade I. Note thin basement membrane, regular architecture, very active spermatogenesis. × 330.

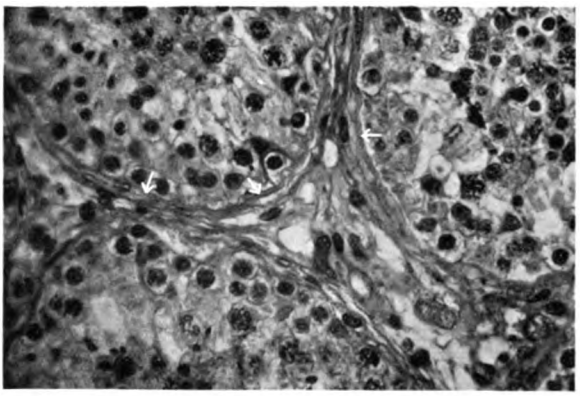

FIG. 16.—Early schizophrenic, aged 20. No. 90. Grade III. *First stage* of change; basement membrane is becoming thick and obvious. × 420.

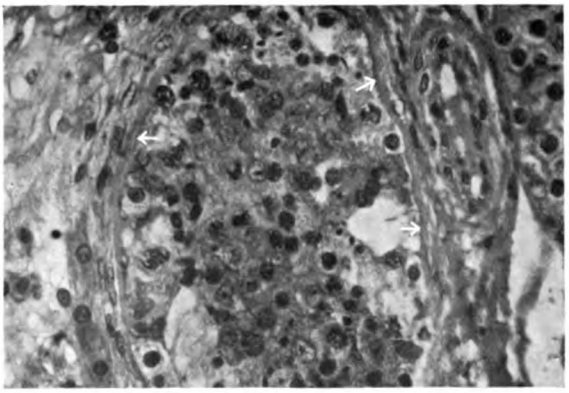

FIG. 17.—Same case as Fig. 20. *Second stage*. Basement membrane thicker, becoming hyalinized. Contents of tubule losing clarity, beginning to break up. × 420.

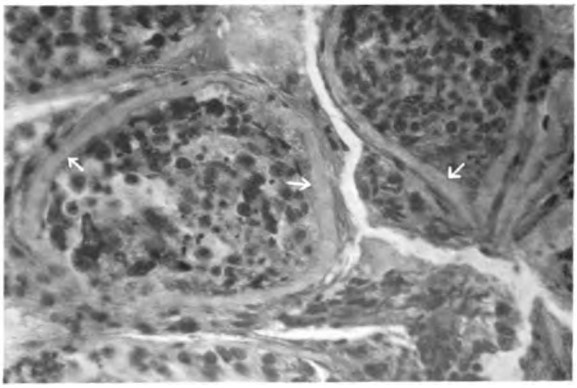

FIG. 18.—Mild chronic schizophrenic, aged 34. No. 54. Grade III. *Third stage* of change: Basement membrane hyalinized, thick and grey, tubular contents degenerating, tubules on left beginning to collapse. × 330.

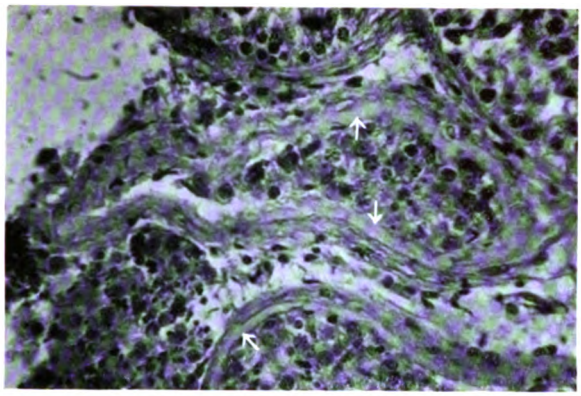

FIG. 19.—Chronic catatonic schizophrenic, aged 34. No. 60. *Third stage.* Note amorphous cell material breaking away from collapsing tubule. Grade V. × 330.

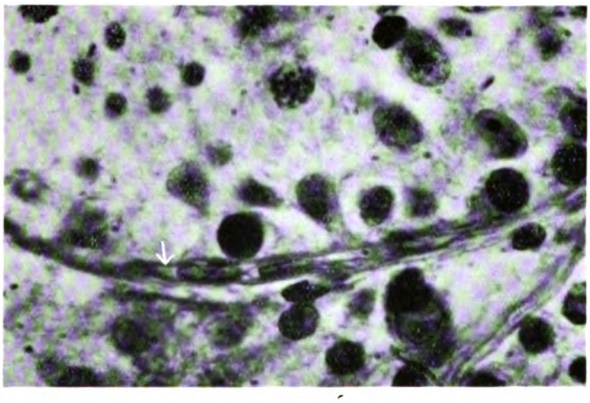

FIG. 20.—Normal tubule, same as Fig. 15. Note thin basement membrane, with seminiferous epithelium closely related and well preserved. Lamellated outer layer of capsule external to its nuclei; thicker than basement membrane. × 960.

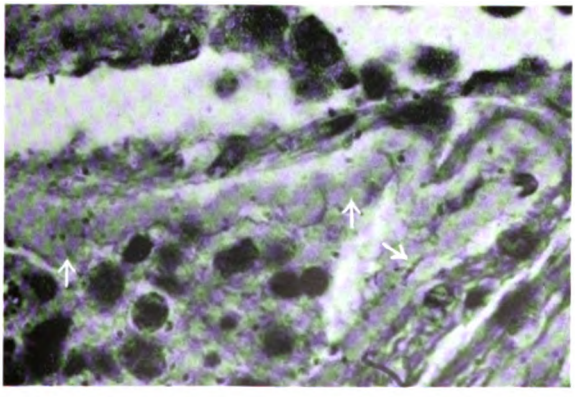

FIG. 21.—Same case as Fig. 13. Grade III. Note thick hyalinized basement membrane extending with folds towards centre of tubule and degeneration epithelium detached from it. Compare with Fig. 24. × 960.

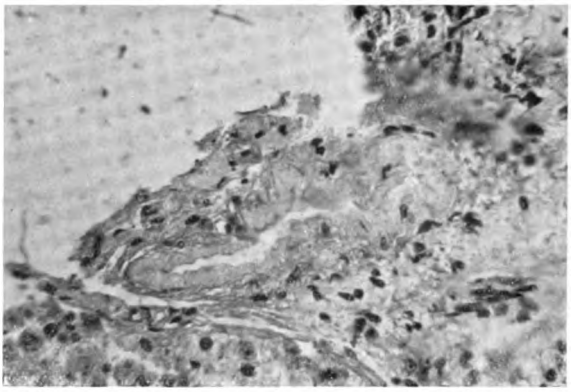

FIG. 22.—Early schizophrenic, aged 15. No. 108. *Fourth stage.* Empty hyalinized tubule. × 330.

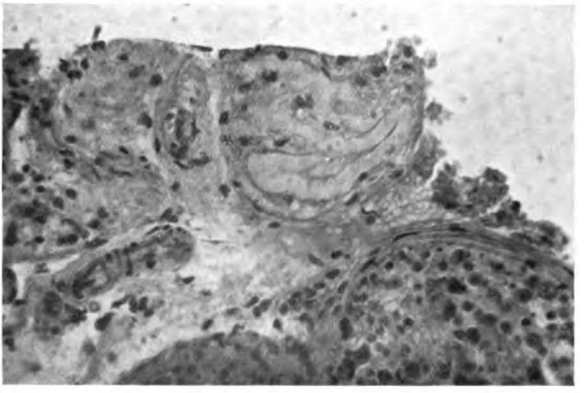

FIG. 23.—No. 60. Same case as Fig. 19. *Fifth stage.* Hyalinized masses of fused tubules. × 330.

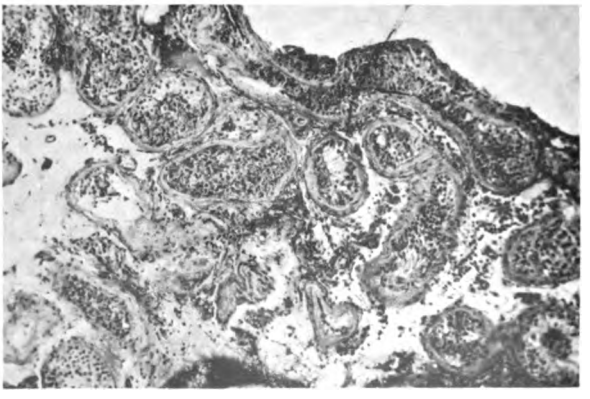

FIG. 24.—Chronic deteriorated schizophrenic, aged 43. No. 63. Highly damaged testis; no normal tubules; end result of atrophic process. × 80.

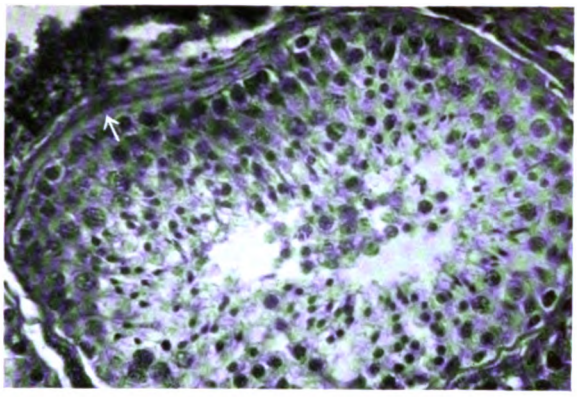

FIG. 25.—No. 54. Same case as Fig. 13, showing patchy hyaline change in one part of tubule. × 330.

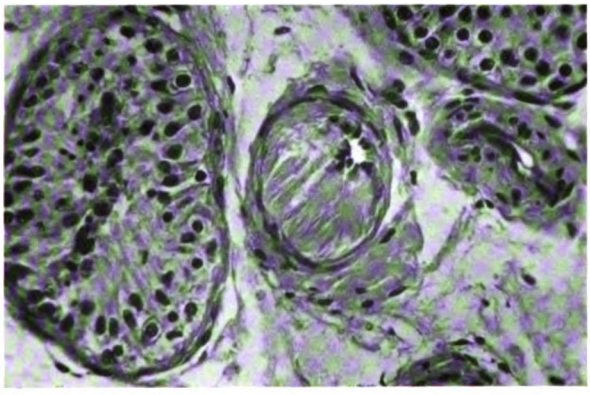

FIG. 26.—Chronic schizophrenic, aged 27. No. 5. Sclerosed vessels in atrophied testis. Grade V. Vessel in centre cut obliquely. × 330.

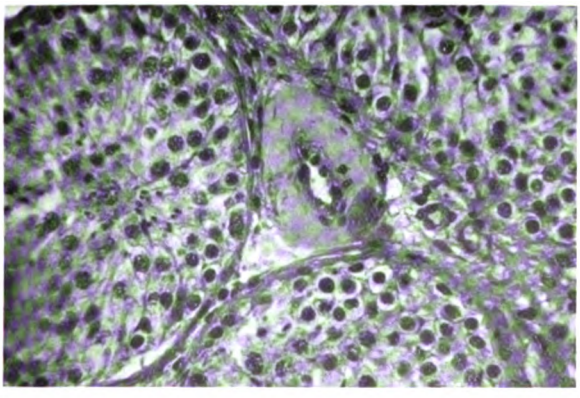

FIG. 27.—Early schizophrenic, aged 19. No. 97. Grade III. Fair tubules besides sclerosed vessel. × 330.

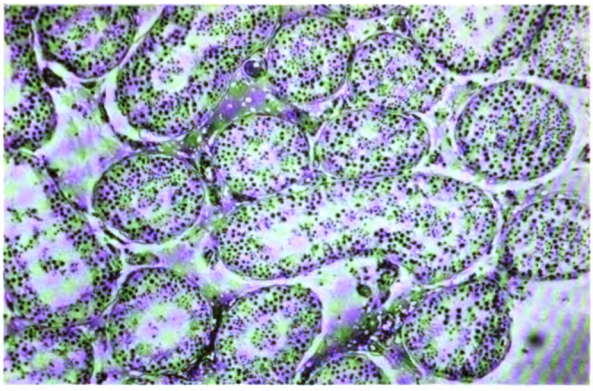

FIG. 28.—Mania, aged 35. No. 34. Normal. Grade I. × 80.

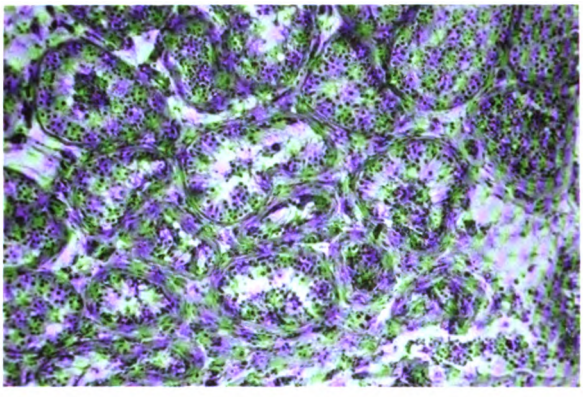

FIG. 29.—Chronic deteriorated schizophrenic, aged 33. No. 21. Peri-tubular fibrosis in shrunken testis. Grade V. × 80.

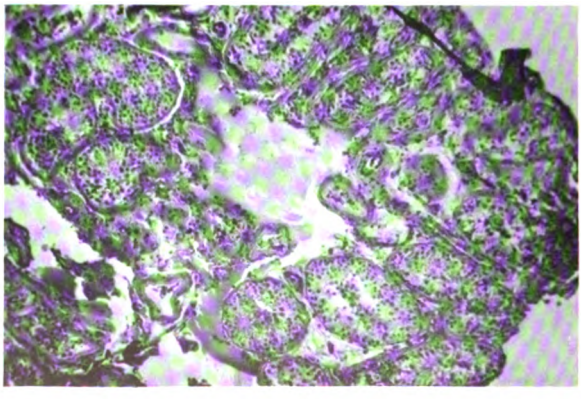

FIG. 30.—Chronic deteriorated schizophrenic, aged 34. No. 46. Grade V. Showing numerous hyalinized and shrunk tubules. × 80.

small and soft. External examination was of little value, for small hydroceles or masses of adipose tissue in and around the tunica vaginalis were not uncommon. In non-atrophic testes the globe felt firm or resilient, and very slight pressure, as soon as the tunica albuginea was incised, caused tubular tissue to extrude. This cut easily and made good histological preparations. The atrophied testes looked shrunken. It was always difficult to open the tunica albuginea cleanly against the reduced resistance, and pressure on the globe failed to extrude the contents. The pieces obtained were friable and broke up in the fixing solution. The nature of the tissue could usually be judged at operation, and it will be noticed that in the low-power photographs the lowest grade specimens are often ragged and small. The apparent preponderance of hyalinized tubules at the periphery is explained by the tissue breaking off in fixation at this fragile place. Awkward haemorrhage from the interior of the testis caused haematocele in three cases and bleeding was often troublesome in atrophic testes, no doubt due to the vascular changes.

There was a noticeable difference in sensitivity in various patients. The tunica albuginea cannot be anaesthetized, and in normals (non-mental) a severe " testis " type of pain is often experienced as it is being incised. This was sometimes sufficient to cause a state of reflex shock and temporary collapse. The shrunken testis of schizophrenia was appreciably more difficult to open quickly, as its softer surface recedes from the knife, and when open the tissue will not extrude without pressure —conditions that should materially increase pain and likelihood of shock. On the contrary, most of these patients ignored this stage of the operation, irrespective of whether they had opposed the earlier manipulation. Severe reflex shock was not seen.

Histological Classification.

The histo-pathological criteria described above may now be applied for the classification of all the biopsy material. It is at once evident that the vast majority of atrophied testes belonged to cases of schizophrenic psychosis, while a fair proportion of those from other mental types were within normal limits or damaged to an extent commensurate only with the age or co-existent physical illness. The table summarizes the distribution of the grades of testis defect according to the mental diagnosis, and records the ages of the non-schizophrenic subjects concerned. Apart from four cases complicated by chronic alcoholism and two syphilitics, the grading of the non-schizophrenic material varied between complete normality (Grade I) seen in cases of mania (Fig. 28), and only moderate loss of germinal epithelium and reduction of spermatogenesis in the older subjects (Grade III). None of these changes is beyond expectation, for if allowance were made for age, all may be regarded as being within normal limits ; of the ten cases in Grade III eight were in the fifth or sixth decade.

The statement that chronic alcoholism always causes testis damage irrespective of the age, frequently quoted from Weichselbaum and Kyrle (1910), is obviously not true. Only one of the four cases in this series showed the changes described by him—thickening of the capsules, increase of interstitial tissue, cessation of spermatogenesis and obliteration of tubules. Case 56 (Figs. 9, 10), a former publican suffering from Korsakoff's psychosis and chronic alcoholism, at 56 the oldest patient investigated, had a highly active testis, with no hyaline change, only mild thickening of the outer capsule layers, and considerable vascular sclerosis. In spite of the greatest abuse of alcohol, this testis and that of Case 58 (also alcoholic) are well up to the normal for the age.

In the two neuro-syphilitics without gummatous orchitis spermatogenesis was almost absent and a dense interstitial fibrosis bound up the tubules, features similar to those described by Mott (1919) in G.P.I. and to the non-gummatous areas of chronic fibrous orchitis of syphilis (MacCallum, 1940).

By contrast with the relatively mild changes in the non-schizophrenic specimens, the preponderance of grossly defective testes in the schizophrenic series is highly significant. Out of a total of 90 only 2 show a normal histology, and no fewer than 71 fall into Grades III, IV, V ; 26, or more than one-third, present extreme atrophic change. It is unnecessary to record individual ages for, unlike the non-schizophrenic group, the vast majority were in the second and third decades, so that in no cases can age be held a contributory factor. For this reason Grade III

defect in schizophrenia is certainly significant, and cannot here be regarded as being within normal limits for the age.

It is justifiable to conclude that the atrophic changes of the testis described in this paper are a specific feature of many cases of schizophrenia; they have not been found in the commoner forms of other mental illness and mental defect, and therefore it is suggested that they are an integral part of some forms, at least, of the schizophrenic reaction group. Clinical evidence in support will be presented in a subsequent paper.

Discussion.

The biopsy material reviewed in this study resolves itself into normal histology, damaged testes with interstitial fibrosis, and the hyalinized testis seen in schizophrenia.

Interstitial fibrosis accompanied by degenerative atrophy of the seminiferous epithelium is a usual result of chronic systemic affections, local trauma, and a variety of toxic processes. It has been regarded as such by Hansemann (1895), Lubarsch (1896), Cordes (1898), Oberdorfer (1930), Charny (1942), and many others. With them we are in agreement. When found in the chronic schizophrenic testis it indicates a superimposed fibrosing process. Case 21 (Fig. 29), who suffered from chronic pulmonary tuberculosis is an example. There is no proof as to whether the atrophy of germinal elements is secondary to capsular fibrosis or not, but it is generally recognized that infections, even of short duration, may cause a cessation of spermatogenesis, in which the later and more mature cells suffer first and the spermatogonia, Sertoli and tubular walls survive longest (Metz, 1938). Five stages of atrophy in unselected post-mortem testes, mainly senile, are described by Schinz and Slotopolsky (1924). The first three cover the stages of degeneration of spermia, spermatids and spermatocytes; in the fourth only a few cells are left, and this state "endures" until succeeded by the stage of hyaline degeneration of the wall of the tubule. This concept, with which Stieve (1930) agrees, assumes that this form of hyalinization of the tubular wall is a late stage of intra-tubular atrophy, and if these authors are correct, constitutes an important point of difference between the atrophied testis of schizophrenia and that due to other causes. In the non-schizophrenic material the abnormalities, therefore, were what might have been anticipated for the age and state of bodily health.

As we have shown, the changes in schizophrenia varied between a slight reduction in spermatogenesis and gross atrophy. A striking and constant feature in the more severely damaged testes is hyaline degeneration of the basement membrane, associated with atrophy of the seminiferous epithelium of the tubules so affected. In some instances the process seems to have been progressive, so that the worst grade of testis is a shrunken organ with few active tubules, many hyalinized in varying degree, and hyaline masses representing the remnants of others (Fig. 30). This state does not depend on the age of the patient, and typical examples were seen in young and old irrespectively. The germinal atrophy succeeds the hyalinization and is dependent on it. In the most damaged specimens spermatogenesis is never completely normal, even in the better preserved tubules, and where there is no severe hyalinization the cart-wheel formation is usually evident. Sclerosis of testicular smaller vessels is common, and there is relatively little interstitial fibrosis. The tubules are mostly of small size, but there is no compensatory hyperplasia of the interstitial substance, as is usually found in other forms of tubular atrophy. Oedema is frequently present; Leydig's cells are inconstant in quantity. As a general rule testicular sensation is much reduced and the tunica albuginea in particular is surprisingly insensitive. These histological and clinical features were found in so many cases of schizophrenia that they must be regarded as characteristic of the state of the testis in this disorder. The correlation of atrophy with clinical forms of schizophrenia will be discussed in a later paper.

The little that is known about atrophy of the testis in humans throws no certain light on the origin of this special form. Conditions that have been accepted as responsible for testis atrophy are: disturbances in food intake—over- or underfeeding; avitaminosis; errors in metabolism; alcohol, nicotine, caffeine and other poisons; acute illnesses; chronic illnesses, such as cancer, tubercle, syphilis; psychic influences (Stieve, 1930). Apart from the few cases specifically mentioned, none of these, psychic excepted, operated in this case-material. The psychic

influences mentioned by Stieve need not be considered, for they refer to the effects of captivity on animals.

The histological changes in the testis of animals (there is so far nothing known about the human) due to deprivation of vitamins A, B group, C, D, E, have been summarized by Mason (1938). They do not resemble what has been described above, and hyalinization of the capsule is not mentioned. Cancer, chronic ill-health, and malnutrition are the commonest causes of tubular atrophy and fibrosis, which are nearly always associated with interstitial hyperplasia (Collins, 1936), although the converse is not true (Bothe and Robinson, 1933). Hyalinization was not observed by these writers. The senile testis shows an inconstant atrophy, and sometimes may be well preserved. Spangarro (1902) has described capsular hyalinization as being a terminal state of atrophy in senility, following cessation of spermatogenesis. It was not observed by Jemerin (1937) in seniles; he commonly noted hypertrophy of the interstitial tissues in proportion to the reduction in tubular size.

Sand and Okkels (1937) found capsular hyalinization in a number of testes of castrated sex criminals. They believed it was in proportion to an earlier atrophy of the underlying epithelium provoking in some way thickening of the basement membrane; this caused impaired nutrition and a vicious circle was established. They do not disclose what were the mental and physical conditions before operation. Sex offences are usually the result of disordered mental states, among them schizophrenia, as seen in some of this case material, and it is possible that the hyalinized specimens were provided by this group. The same applies to other similar work, for no allowance has ever been made for mental illness, and no histologist seems to have suspected its importance in pathological material that was not specifically supplied from mental hospitals.

It might be suggested that the damaged tubules in the schizophrenic testis are due to imperfect development, and represent degenerative changes in infantile and immature structures. The small size of many of the tubules and the youth of some of the patients in the worst grades might seem to support this. Charny (1942) assumes that "failure of tubular development is indicated histologically by the presence of small tubules filled with undifferentiated cell forms. Peritubular fibrosis was not present." The statement is not supported by evidence. Hypoplastic testes are found frequently in children under 11 years, but in less than 6 per cent. between 12 and 20 (Voss, 1913), and are usually normal by puberty (Diamantopoulos, 1921; Wangensteen, 1927). It would be exceptional to find a high proportion of hypoplastic testes in schizophrenia unless there were some reason to associate errors of development with this illness, and no such reason exists. Moreover, the thick tunica albuginea, normally fully mature between 15 and 17 years (Stieve, 1930), and the characteristics of most tubules, indicates complete pubertal development. Some degree of hyaline degeneration may be seen in tubules of the largest adult size which still produce adult spermia, although the more severely damaged tubules are usually small. We can therefore assume that the hyalinized tubules seen in pubertal and early adolescent cases are not necessarily immature, and that the pathological process shows no predilection for tissues in retarded development.

The only reason that might be suggested for regarding the vascular sclerosis as of primary importance is the experimental evidence that section of the internal spermatic artery in dogs is followed by reduction in size of the testis and scattered areas of degeneration (Wangensteen, 1927). It is noteworthy that hyalinization of the basement membrane was not described in his experiments. In our cases the association of vessel and testis change was not invariable, and in the non-schizophrenic material considerable vascular sclerosis did not produce tubular atrophy.

It is less easy to exclude impairment of nerve supply as the causative factor. Ablation of the inferior mesenteric ganglion and nerves of the right spermatic artery in dogs is followed by extensive germinal degeneration (Kuntz, 1919; Takahashi, 1922). Autonomic abnormalities are common in schizophrenia, and it was noted that at operation many patients showed no appreciation of pain or severe reflex shock when the tunica albuginea was opened. But the whole problem of the nerve supply of the testis and its component parts is still obscure, and much more corroborative evidence of local nerve impairment would be necessary to establish a

neural origin for the tubular atrophy, for obviously the relative anaesthesia of the tunica albuginea might be explained on different grounds.

Cryptorchidism has been more extensively studied than any other abnormality of the testis in the human, and there are points of similarity between the cryptorchid and the schizophrenic testis. The evidence is that both local and endocrine factors operate. In experimental cryptorchidism the Sertoli cells usually persist (Moore, 1924), but atrophy and hyalinization of the basement membrane may occur (Dick, 1936). Up to puberty the testis may be normal, but thereafter there is a progressive atrophy corresponding to the age, although spermatozoa have been found in the semen at 24, and a fairly well-preserved germinal epithelium occasionally in the sixth and seventh decade (MacCallum, 1935; Rea, 1942). There is thus a proportion of tubules capable of functioning even years after puberty. Capsular fibrosis with hyalinization may occur which precludes any chance of regeneration (Pace and Cabot, 1936). Most modern authors remark on the notable absence of hyperplasia of the interstitium. In the patchy progressive atrophy, with local hyaline changes, the persistence of some co-existent germinal activity, the presence of some tubules containing only Sertoli cells ("cart-wheels"), the lack of an interstitial hyperplasia and the preservation of an internal secretion, the resemblance to the schizophrenic testis is close. In both conditions some interference with the normal development and health of the seminiferous epithelium is apparent. In cryptorchidism local heat is the principal agent (Moore, 1924), but interference with the normal hormonal control could achieve a similar result. In schizophrenia there is no local factor, and as the pathology is not that of changes due to noxious agents, an endocrine cause is the most probable.

Almost nothing is known of the hormonal control of the adult testis in the human or of the changes that follow its modification or withdrawal. Destructive conditions of the anterior pituitary may cause gonadal atrophy, and extensive tubular degeneration with hyalinization of the capsules may result from hypothalamic tumours (personal observation).

In one case of endocrinopathy, where only a fragment of thyroid remained, there were reduced spermatogenesis, wide oedematous interstitial spaces and no interstitial hyperplasia (Wegelin *et al.*, 1926); in a case of myxoedema with a pituitary adenoma Marine (1939) noticed small testes, with small widely spaced tubules; there was no spermatogenesis, the Sertoli cells were intact, the interstitial cells much reduced. It appears that in general, atrophy of the testes associated with endocrine disorder is not accompanied by the interstitial hyperplasia usually seen in other conditions. Degeneration of the human testis can be produced by administration of oestrogen, which depresses the activity of the anterior pituitary (Zondek, 1936). Biopsy studies were made on two patients before and after treatment with stilboestrol by Dunn (1941). There was marked degeneration of the seminiferous epithelium, reduction in size of the tubules and number of interstitial cells. The published photomicrographs show "cart-wheels," and in one case what appears to be moderate hyalinization of the basement membrane. Regeneration is said to have occurred some time after cessation of treatment.

Although more is known of pre-pubertal pituitary insufficiency, the exact histology is still to be presented, and it has still to be shown how far lack of gonadotrophic hormone in adults is responsible for mild degrees of germinal atrophy, oligospermia and the contradictions of senility. Atrophied tubules and hyalinized capsules without interstitial fibrosis have been attributed to endocrine causes (Charny, 1940, 1942; Hotchkiss, 1942); but they supply insufficient proof, and the published results of gonadotrophic hormone therapy are neither convincing nor satisfactory. Hypophysectomy causes gonadal atrophy in animals; the changes are not similar in different species. Reduction in tubular size, thickening of the capsule and cessation of spermatogenesis with appearance of immature cells is usual in rats and monkeys (Smith, 1938). We have examined a large number of testes of rats at various periods after complete and partial hypophysectomy. The sudden arrest of spermatogenesis produced the "punched-out" effect described before (Figs. 7, 8); the resemblance was greatest a week or less after operation and after incomplete hypophysectomy; slight interstitial oedema was observed as the tubules shrank but only before interstitial fibrosis had replaced it. Capsular thickening, not indisputably of the innermost layer, was always an accompaniment of atrophy; hyalinization was not seen. Although frequently described in humans,

hyalinization does not seem to have been noticed in animals, and to our knowledge it appears in neither the accounts nor the photomicrographs of animal experiments. The comparative histology can be taken no farther, and it may be fairly claimed only that some of the pathological features of the schizophrenic testis are also seen in testis atrophy after hypophysectomy in lower animals. We have attached some importance to the relatively small interstitial amount of interstitium and the poor interstitial response to tubular atrophy. If, as we believe, the form of atrophy we have described in schizophrenia has an endocrine origin, this might be due to a failing pituitary regulation, whereby the so-called interstitial cell stimulating hormone is no longer produced as a compensatory process. It has still to be shown how far the histological changes might be due, if this assumption be accepted, to the inability of the anterior lobe of the pituitary to maintain an adequate output of gonadotrophic hormone under physiological conditions, or to increase its production in response to necessity. Although outside the scope of this histological paper, we felt obliged to remark that while none of our schizophrenic patients were clinical hypogonads, abnormalities of the distribution of hair, especially of the growth of the beard, were common, in spite of obviously well-developed external genitals—an effect in keeping with a condition of partial, or qualitative, gonadotrophic hypofunction. We hope at some future date to be able to investigate the ratio of androgen to oestrogen in some of these cases, with a view to clarifying this point.

The foregoing account covers most of what is known or has been described of the histology of atrophic changes in the human testis, not the result of local trauma, tumour or orchitis. It is evident that there is much more to be learned, and in this respect testicular biopsy offers the only useful method of obtaining reliable histological material. Such material should be evaluated with regard to all clinical aspects, mental as well as physical and endocrine.

In the detailed descriptions of Mott (1919), Lewis (1923), " parenchymatous " tubular degeneration appears. Great importance was attached by Mott to interstitial hyperplasia. This, as has been shown, is characteristic only of physical disorders, and was in all probability due to the morbid processes that brought the patients to autopsy. It was therefore a pathological contamination, and probably in most cases superimposed on the more specific type of atrophy. Hyaline degeneration of the basement membrane was often seen.

Original preparations made available for study by the kindness of Prof. Nevin, Prof. Golla and Dr. A. Meyer, and photomicrographs of Mott show many examples similar to some of those reproduced here. The cytological investigations (McCartney, 1929) have made little contribution to the histology of the human testis.

Although this study confirms the contention that testis atrophy in schizophrenia does occur, it disagrees in the main with what Mott and his contemporaries regarded as characteristic of the histology, its causation and significance in pathogenesis of the disorder. Tiffany (1929) alone seems to have commented on the lack of interstitial cells and poor interstitial reaction compensatory to tubular atrophy in schizophrenia. Sclerosis of testis vessels has not been described before in this condition. Lewis (1923) endeavoured to show that hypoplasia of the cardiovascular system was a constitutional defect in schizophrenia, but almost certainly he was describing the results of bodily wasting in chronic tuberculosis, from which most of his younger patients died.

Summary.

Histological examinations were made of biopsy specimens from the testes of 90 cases of schizophrenia and 25 cases of other mental disorders. Pathological changes of varying severity were observed in many specimens; these changes have been classified in grades according to the intensity of the degenerative process.

The non-schizophrenic specimens were within normal limits, due allowance being made for age and organic disease.

A special form of atrophy involving chiefly the tubules and their contents was found in many cases of schizophrenia, but not in other mental disorders. This atrophy is characterized by changes in the basement membrane leading to its hyalinization, with arrest of spermatogenesis, progressive degeneration of epithelial elements, and eventual destruction of the tubule. The course and development of

this atrophy have been described and analysed. It differs in essential features from atrophy due to systemic affections and to the familiar causes of testis degeneration. Interstitial hyperplasia is rare, and when present in schizophrenic subjects is due to some superimposed organic process.

The work of Mott and others has been discussed in the light of this study. Although they reported pathological changes which they regarded as specific for schizophrenia (dementia praecox), the histology differed significantly from what is described in this paper. It is clear that as autopsy was the only source of their material, serious contaminating factors, such as advanced age and intercurrent infections, were introduced, and would inevitably tend to obscure the histological picture.

The importance of a normal basement membrane for preservation of Sertoli cells and seminiferous epithelium has been demonstrated, and it has been shown that hyaline change in the basement membrane in atrophy of the testis is a cause and not a result of degeneration of the epithelium as other writers have suggested.

GRADES OF DEFECT.

Diagnosis.	1.	2.	3.	4.	5.	Total.
Mania	(39) (33) = 2	(39) = 1	—	—	—	3
Depression	—	(45) (18) = 2	(44) = 1	—	—	3
Involutional melancholia	—	—	(51) (55) = 2		—	2
Neuroses	(41) = 1	(43) = 1	(47) (38) = 2	—	—	4
Chronic alcoholism*	—	—	*(50) *(55) *(42) = 3	—	*(45) = 1	4
Syphilis*	—	—	—	*(49) *(20) = 2	—	2
Organic brain disease	—	(41) = 1	—	—	—	1
Mental defect	—	(40) (25) (38) (38) = 4	(28) (41) = 2	—	—	6
Total	3	9	10	2	1	25
Schizophrenia	2	17	24	21	26	90

N.B.—Patient's age is in parentheses.

* = Known organic or endocrine condition associated with mental illness.

Hormone estimations were made at the Burden Neurological Institute, Bristol, under the direction of Dr. Max Reiss.

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THE SIGNIFICANCE OF ATROPHY OF THE TESTIS IN SCHIZOPHRENIA.

By R. E. HEMPHILL, M.A., M.D., D.P.M.,
Medical Superintendent, Bristol Mental Hospital.

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IN another paper in collaboration with Reiss and Taylor (1944) I have described and classified the state of testis function in schizophrenia, mental defect, and the common mental illnesses from an examination of specimens obtained by biopsy from 115 representative subjects, selected for adequate physical health and development. It was found convenient to classify all material in five grades according to the histological appearances. These have been fully described in our paper. In brief they indicate (1) complete normality, (2) normality with slight defects, (3) moderate atrophy, (4, 5) severe and very severe atrophy amounting in the worst cases to total loss of normal function. While we have regarded a Grade 3 specimen as significant in young subjects, it is probably not necessarily outside the normal expectation from the fourth decade upwards. Grades 4, 5 are, of course, indicative of a severe atrophying process at any age. In analysing the defects we noted and described degeneration of the seminiferous elements with changes in the tubular capsule. The basement membrane was affected first and principally, and underwent a form of hyaline degeneration. This, we felt, was the underlying cause of the atrophy of the seminiferous epithelium, and eventually led in many instances to complete destruction of lengths of the affected tubules. The interstitium was not subject to important change.

This pathological picture was not seen to any extent in post-mortem testes from non-mental cases; it was confined to cases of schizophrenia alone, and it has not been commented on in the literature. Specimens from the non-schizophrenic psychoses and mental defect were on the whole normal, and such deviations as were observed could be attributed to age or some accompanying physical illness (Table I). They have been dealt with in our other paper.

TABLE I.—*Case-Material and Distribution of Grades of Testis Defect.*

Diagnosis.	Total.	Grade of defect.				
		1.	2.	3.	4.	5.
Mania	3	2	1	—	—	—
Depression	3	—	2	1	—	—
Involutional melancholia	2	—	—	2	—	—
Neuroses	4	1	1	2	—	—
Alcoholism	4	—	—	3	—	1
Syphilis	2	—	—	—	2	—
Org. brain disease	1	—	1	—	—	—
Mental defect	6	—	4	2	—	—
Total	25	3	9	10	2	1
Schizophrenia	90	2	17	24	21	26

Although atrophy was found in a large proportion of the schizophrenic specimens, not all were affected with equal severity, and examples of all the five grades were encountered. It was, therefore, of great importance to ascertain whether there was any correspondence between the degree of atrophy and the form or severity of the psychosis; whether the atrophy was a sign of some subtype of schizophrenia,

determined by some other accompanying disorder, or related to physique and heredity; and whether testis biopsy might help in making a prognosis. These and allied questions are examined in this paper, and it has been possible to supply a partial answer at least to some of them.

I must emphasize that there is no sharp line of demarcation between the grades of atrophy; all are arbitrary. They were arrived at after very careful consideration of all the facts known to us, aided by the experience we had gained. We have judged the defects leniently to perhaps an extravagant extent, for we wished to avoid possible bias. Obviously this implies that some specimens we have judged as Grades 2, 3 are in reality more abnormal, and therefore clinical correlates of these milder grades of defect may in some instances be less exact than they appear to be. For example, an apparent association between milder forms of schizophrenia and moderate grades of atrophy is only true in so far as the assessment of moderate atrophy is exact. As no schizophrenic specimen could be upgraded, but some might conceivably be graded lower, the general proposition, that "special" atrophy of the testis is a characteristic of schizophrenia, tends to be strengthened. At the same time the "spreading" of the specimens over the intermediate grades of atrophy, which will be observed in the mild chronic form of the disease (Table II), can be understood. The worst grades of atrophy include only grossly abnormal specimens, utterly unfertile and inactive, with grave defects of a sort that we have not encountered in ordinary post-mortem material, nor seen described in the writings of others, and are therefore hardly susceptible to further division.

The following classification avoided some of the objections to previous research in that the malignancy of the disease was assessed by the mental condition of the patient at the time of investigation, and it was not necessary to rely on old case-notes written by others.

(a) *Early*.—The duration of the mental illness was less than one year. The eventual outcome could not, therefore, be estimated with certainty at the time of biopsy.

(b) *Mild chronic*.—The illness was arrested, but not cured, above the level of degraded habits and extreme deterioration. Such cases are to be found in the rather apathetic chronic population of every mental hospital, who employ themselves in a leisurely fashion and keep themselves clean.

(c) *Chronic deteriorated*.—The personality was disintegrated, habits degraded, and deterioration extreme.

(d) *Chronic catatonic*.—This group was considered separately from the "chronic deteriorated," irrespective of the degree of deterioration, because of its course and special clinical features.

(e) *Paranoid*.—This was the recognized dementia paranoides, in which there is no tendency to remission and severe deterioration is unusual.

(f) *Mixed*.—There was a complicating affective element. The course of the illness and response to treatment was atypical; all the patients recovered.

In three cases of schizophrenia there was a degree of underlying high-grade mental defect. As it had already been found that the testis is not necessarily abnormal in mental deficiency, they were included with the others.

Table II shows the distribution of testis state in the categories.

TABLE II.—*Grades of Testis Defect in Forms of Schizophrenia.*

Diagnosis.	Total.	Grade of defect.				
		1.	2.	3.	4.	5.
Early	16	1	1	4	4	6
Mild chronic	19	1	5	7	5	1
Deteriorated chronic	22	—	—	3	7	12
Chronic catatonic	12	—	1	4	2	5
Paranoid	17	—	10	4	1	2
Mixed	4	—	—	2	2	—

If the pathological material is arranged according to the grading of testis defect, and classified according to its clinical form, the result, as shown in Table II, indicates that certain forms of schizophrenia seem to be predominantly associated with a certain grade of testis defect. The apparent relationship between testis defect and clinical form of schizophrenia can now be analysed.

There are (Table II): Early, 16; mild chronic, 19; deteriorated chronic, 22; catatonic, 12; paranoid, 17; mixed, 4; in all 90 cases.

It may be assumed that on the whole Grade 2 defects of testis are within normal limits. The bulk of specimens, therefore, from the deteriorated chronic and chronic catatonic forms are highly abnormal; from the mild chronics less so and from the paranoids within normal limits.

Examining each mental group separately, it will be seen that:

In *early* schizophrenia, out of 16 cases 1 was entirely normal, 1 approximately normal; 4 were moderately, 4 more severely and 6 very severely damaged. Out of a total of 16, 14 specimens were defective; in 10 of these there was serious pathological atrophy.

In *mild chronic* schizophrenia, out of 19 cases 1 was entirely normal, 5 approximately normal; 7 were moderately, 5 more severely, 1 very severely damaged. Atrophy was found in 13 out of 19 specimens, but to a severe degree in no more than 6. It may be assumed, therefore, that while atrophy of the testis is characteristic of mild chronic schizophrenia, it is likely to be moderate only.

In *chronic deteriorated* schizophrenia, not one was entirely or even approximately normal; 3 were moderately, 7 more severely, and 12 very severely damaged. Atrophy was found in every instance in the 22 cases of this group, to a severe extent in all but 3. Severe degeneration of the testis is highly characteristic of chronic deteriorated schizophrenia.

In the *catatonic* form of schizophrenia, out of 12, 1 was approximately normal; 4 were moderately, 2 more severely, and 5 very severely damaged. Some atrophy was found in 11 out of 12 specimens; to a severe degree in 7. Testis damage, likely to be severe, is therefore associated with chronic catatonic schizophrenia.

In the *paranoid* form of schizophrenia, out of 17, 10 were approximately normal; 4 were moderately, 1 more severely and 2 very severely damaged. Some atrophy was, therefore, found in 7 out of 17 cases, but to a severe degree in only 3. Atrophy of the testis is rare in paranoid schizophrenia and not characteristic of this condition.

In the *mixed* form of schizophrenia, out of 4 cases, 2 were moderately and 2 were severely damaged. The significance of this finding will be commented on later.

It appears from this table that, excluding the paranoid form, there is a fairly regular association between atrophy of the testis and schizophrenia. There is as well a fair correlation between the severity of the atrophying process and the degree of eventual mental deterioration reached in the course of the disease.

It is especially noteworthy that the largest proportion of moderately damaged testes in any group occurred in the mild chronic or arrested form Normal specimens and specimens conforming to every degree of atrophy were found in early schizophrenia. The subsequent history of these early cases should confirm or refute the hypothesis that clinical course and pathological state are related. As some of these early cases have been under observation for more than a year since operation, the outcome can now be either forecast or definitely determined. Excluding remissions, the total is 13 cases. If these are analysed according to clinical form, it will appear that in each class there are the following cases:

TABLE III.—*Probable Clinical Forms in Early Cases.*

Diagnosis.	Total.	Grade of defect.				
		1.	2.	3.	4.	5.
Mild chronic	4	—	1	2	—	1
Deteriorated chronic	5	—	—	1	2	2
Catatonic	3	—	—	1	1	1
Paranoid	1	1	—	—	—	—
Remission	3	—	—	—	1	2
Total	16	1	1	4	4	6

Grade 1 . . . Paranoid, 1.
" 2 . . . Mild chronic, 1.
" 3 . . . Mild chronic, 2; chronic deteriorated, 1; catatonic, 1.
" 4 . . . Chronic deteriorated, 2; catatonic, 1.
" 5 . . . Mild chronic, 1; chronic deteriorated, 2; catatonic, 1.

Mild chronic.—Out of 4 cases, 1 was approximately normal; 2 were moderately and 1 very severely damaged.

Chronic deteriorated.—Not one was entirely or approximately normal; 1 was moderately, 2 more severely and 2 very severely damaged.

Catatonic.—Out of 3, cases, 1 each was moderately, severely and very severely damaged.

Paranoid.—The only case was normal.

The distribution of these results agrees with that of the main series, and does not contradict it in any way. In other words, the association between deteriorating schizophrenia and severe atrophy is confirmed. Further, the analysis shows that the most severe degree of degeneration of the testis may be present in the earliest stages of schizophrenia, before symptoms are well developed or the psychosis has reached its height, and that in early cases severe atrophy of the testis does not rule out the possibility of remission. Remission does not assume recovery, for subsequent relapse is common in schizophrenia. Case 92 relapsed and returned to hospital one year after the first biopsy. The second biopsy was similar. He is now becoming chronic. Case 108, aged 16, the second to "recover," has had a fluctuating illness, with previous short attacks and remissions, and is now out of hospital and free from symptoms. Case 117, aged 19, after an acute catatonic onset has had several brief remissions, and is now about to leave hospital practically, but not entirely, free from symptoms. False recoveries and short remissions are common in early schizophrenia, but in the majority of cases are only the prelude to the fully developed psychosis. There is no record of any patient, apart from Cases 92, 108 and 117, in whom any sustained improvement, much less recovery, occurred after biopsy had demonstrated a Grade 5 testis. The one case to remit with Grade 4 testis has left hospital with residual symptoms. It is uncertain whether he has remained well. A striking fact revealed by the analysis of the early group is that in three cases (32, 98 and 100), where the illness was acute and ran a rapidly unfavourable course with much deterioration in less than one year, there was Grade 5 atrophy.

Mixed schizophrenia was not represented in the early cases. The four examples in the main series may be contrasted with those of the true affective psychoses. In all four the testis was abnormal. The inference is that, while in the affective psychoses the testis is normal, if there is a schizophrenic taint it will show the picture characteristic of the graver disorder. This agrees with clinical experience, for the prognosis is usually much less favourable if there are schizophrenic elements in a predominatingly affective psychosis.

Influence of Age at Operation on Degree of Testis Defect.

Some degree of atrophy of the testis is said to occur more frequently with increasing years. If age by itself is at all responsible for atrophy in schizophrenia, its influence should be revealed when the case-material is analysed according to age-groups. Convenient age-groups were: Up to and including 20; 21 to 25; 26 to 35; over 35 (Table IV). Analysing each age-group irrespective of the clinical form of schizophrenia, it appears that—

Up to 20: Out of 12, 6 were very severely damaged, none were normal.

21 to 25: Out of 17, 11 showed severe or very severe damage, 4 (or approximately one-quarter) were within normal limits.

26 to 35 (the largest single group): Out of 44, in 21 (about one-half) there was severe or very severe testis damage; 11 (about one-quarter) were within normal limits.

Over 35: Out of 17, in 9 (approximately one-half) there was severe or very severe damage; 4 (approximately one-quarter) were within normal limits.

From the age of 21 upwards roughly one-quarter of the specimens were within normal limits in each group. The greatest proportion and highest numbers of Grades 4 and 5 atrophy of testis occurred in age-groups below 35. There is no worsening with years, and age by itself is in no way responsible for the degree of atrophy. The later onset of the paranoid form accounts for the apparent improvement with increasing age. The comparatively normal testes of this group tend to balance those more severely damaged in the chronic deteriorated and chronic catatonic groups of earlier onset and long duration.

It is possible that age by itself exerts an unfavourable influence on the state of the testis, in addition to the degree of atrophy that appears to be characteristic of each clinical form. If true, the severe grades of atrophy would be distributed among the older age-groups within each clinical form. This possibility can be examined (Table IV).

TABLE IV.—*Age at Operation.*

Up to 20.

Diagnosis.	Grade of defect. 1.	2.	3.	4.	5.	Total.
Early	—	—	3	—	4	7
Mild chronic	—	—	1	—	—	1
Deteriorated chronic	—	—	1	—	2	3
Chronic catatonic	—	—	—	—	—	—
Paranoid	—	—	—	—	—	—
Mixed	—	—	1	—	—	1
Total	—	—	6	—	6	12

21 to 25.

Early	1	1	1	3	2	8
Mild chronic	—	1	1	2	—	4
Deteriorated chronic	—	—	—	2	1	3
Chronic catatonic	—	—	—	—	—	—
Paranoid	—	1	—	—	—	1
Mixed	—	—	—	1	—	1
Total	1	3	2	8	3	17

26 to 35.

Early	—	—	—	1	—	1
Mild chronic	1	3	5	1	—	10
Deteriorated chronic	—	—	2	3	7	12
Chronic catatonic	—	—	2	2	5	9
Paranoid	—	7	1	1	1	10
Mixed	—	—	1	1	—	2
Total	1	10	11	9	13	44

Over 35.

Early	—	—	—	—	—	—
Mild chronic	—	1	—	2	1	4
Deteriorated chronic	—	—	—	2	2	4
Chronic catatonic	—	1	2	—	—	3
Paranoid	—	2	3	—	1	6
Mixed	—	—	—	—	—	—
Total	—	4	5	4	4	17

Early.—There are 16 in all, none over 25.
Up to 20: 4 out of 7 are Grade 5, none normal.
21 to 25: 5 out of 8 are Grades 4 or 5.
26 to 35: 1 case Grade 5.
Mild chronic.—There are 19; only 1 under 20, 14 between 20 and 35, 4 over 35.
Up to 20: 1 case Grade 5.
21 to 25: None in Grade 5, 2 out of 4 in Grade 4.
26 to 35: Out of 10, 1 only in Grade 4, and none worse.
Over 35: Out of 4, 3 in Grade 5.
Chronic deteriorated.
Up to 20: Out of 3, 2 Grade 5.
21 to 25: 3, all in Grades 4 and 5.
26 to 35: Out of 12, 10 in Grades 4 and 5.
Over 35: 4, all in Grades 4 and 5.

Chronic catatonic.—All 12 cases were over 25. The only one within normal limits was 36 years old.

26 to 35: Out of 9, 7 in Grades 4 and 5.

Over 35: Out of 3, none in Grades 4 and 5.

Paranoid.—16 out of 17 were over 25, of which 10 were approximately normal.

21 to 25: 1 in Grade 2.

26 to 35: 7 out of 10 approximately normal, 2 in Grades 4 and 5.

Over 35: 2 out of 6 approximately normal, 3 in Grade 3 (which is possibly equivalent to Grade 2 in the younger age-groups), 1 in Grade 5.

This analysis shows that age exerts no particular influence in any clinical form. The most damaged testes are to be found in the mental types with which they are associated, irrespective of age. In the oldest patients the possibility that changes due to age rate an otherwise normal testis as low as Grade 3 does not affect this proposition.

Influence of the Age of Onset of the Psychosis on the State of the Testis.

The onset of schizophrenia that runs a mild or severely deteriorating course is early, usually before 20, of the catatonic and paranoid forms around 25 and 30 respectively. The age of onset, therefore, should bear the same relation to the

TABLE V.—*Age at Onset of Each Type of Schizophrenia.*

0 to 20.

Diagnosis.	Grade of defect. 1.	2.	3.	4.	5.	Total.
Early	—	—	3	1	4	8
Mild chronic	—	1	2	2	—	5
Deteriorated chronic	—	—	3	1	10	14
Chronic catatonic	—	—	1	2	1	4
Paranoid	—	—	—	—	—	—
Mixed	—	—	—	2	—	2
Total	—	1	9	8	15	33

21 to 25.

Early	1	1	1	2	2	7
Mild chronic	1	4	3	1	1	10
Deteriorated chronic	—	—	—	4	2	6
Chronic catatonic	—	—	2	—	4	6
Paranoid	—	3	—	—	—	3
Mixed	—	—	—	—	—	—
Total	2	8	6	7	9	32

26 to 30.

Early	—	—	—	1	—	1
Mild chronic	—	—	2	2	—	4
Deteriorated chronic	—	—	—	2	—	2
Chronic catatonic	—	1	—	—	—	1
Paranoid	—	7	3	—	2	12
Mixed	—	—	1	1	—	2
Total	—	8	6	6	2	22

Over 30.

Early	—	—	—	—	—	—
Mild chronic	—	—	—	—	—	—
Deteriorated chronic	—	—	—	—	—	—
Chronic catatonic	—	—	1	—	—	1
Paranoid	—	—	1	1	—	2
Mixed	—	—	—	—	—	—
Total	—	—	2	1	—	3

degree of atrophy as does the clinical condition with which it is associated. Although this has proved to be the case, it is of some interest to ascertain if in any one form of psychosis an early onset is more favourable than a late. For this purpose the material has been divided into closer age-groups—up to 20, 21 to 25, 26 to 30, over 30 (Table V).

Early.—Up to 21, 5 out of 8, and between *21 to 25*, 4 out of 7, were Grades 4 and 5. There is no evidence.

Mild chronic.—In this form, 10 out of 19, the largest proportion of specimens, are in the 21 to 25 age-group, and there are insufficient numbers in other age-groups to show that there is any association here between age of onset and degree of atrophy. Taking Grades 4 and 5 together, the first three age-groups contribute 2 each. It may be said only that the sample of testis atrophy most characteristic of the mild chronic form of schizophrenia is seen when the onset of the psychosis is between 21 to 25.

Chronic deteriorated.—Here a different picture obtains. 14 out of 22 are in the youngest age of onset group. Only 2 fell ill after 25. An early onset is associated both with severe mental deterioration and severe testis atrophy.

Chronic catatonic.—In 10 out of 12 the onset was before 25, and of these none was up to Grade 3.

Paranoid.—The characteristic age of onset in this form is 26 to 30. The few cases outside this group, 3 before and 2 after, do not show the most severe atrophy. Neither an early nor a late onset is of significance in paranoid schizophrenia.

The degree of testis atrophy has been shown to have a high correlation with the severity of mental deterioration in chronic schizophrenia. General experience shows that an early onset usually means an unfavourable course. The foregoing analysis, therefore, strongly suggests that there is a relationship between age of onset and degree of atrophy, as well as the already established correlation with the form and course of the psychosis. This can be more clearly seen if the case-material is analysed in a different way (Tables VI and VII). In Table VI the entire case-

TABLE VI.—*Number of Chronic Non-paranoid Patients and Testis Defect in Each Age of Onset Group.*

	Grade of defect.					Total.
	1.	2.	3.	4.	5.	
0–20	—	1	6	5	11	23
21–25	1	4	5	5	7	22
26–30	—	1	2	4	—	7
Over 30	—	—	1	—	—	1

TABLE VII.—*Testis Defect in Mild and Deteriorated Chronics, including Catatonics.*

	Mild.	Deteriorated.	Total.
0–20	7	16	23
21–25	10	12	22
26–30	4	3	7
Over 30	1	—	1

material, excluding the early and paranoid forms, has been divided into groups according to the age of onset and classified according to the degree of atrophy. In Table VII the same material has been divided into the same age-groups and classified as mild and deteriorated. Comparison of these two tables shows that if Grades 4 and 5 atrophy are lumped together, representing severe change, the proportion of specimens showing this degree of atrophy is almost exactly the same as the proportion of deteriorated cases in each age-group. For this analysis chronic catatonics have been included. With the exception of 2, all were "deteriorated." Tables VI and VII show that—

Up to 21: Out of 23 chronics—7 mild, 16 deteriorated—7 testes in Grades 2, 3; 16 in Grades 4, 5.

21 to 25: Out of 22 chronics—10 mild, 12 deteriorated—10 testes in Grades 1, 2, 3; 12 in Grades 4, 5.

26 to 30: Out of 7 chronics—4 mild, 3 deteriorated—3 testes in Grades, 2, 3; 4 in Grade 4.

Over 30: One deteriorated chronic and one testis Grade 3.

The correlation between the degree of atrophy of the testis and the severity of the mental illness is true whether the onset is before 20 or within the next 5 years; and as schizophrenia of early onset tends to run a most unfavourable course, a severe atrophy of testis is likely to be found in young patients with a poor prognosis. The degeneration of the testis runs parallel with and is therefore an integral part of the psychosis. This statement assumes that as severe a degree of atrophy existed in the chronic patients at the onset of the psychosis as was found, perhaps years later, at operation. This assumption is warranted for the following reasons:

(1) Grades 4 and 5 atrophy were found in early cases, including the youngest.

(2) The age at operation and the duration of the psychosis did not influence significantly the classification of testis defects in any form of illness.

(3) It has already been shown that the mild chronic form and the moderately damaged grade of testis associated with it do not alter to any extent with the passage of time.

Relation of Testis Defect to Incidence of Insanity in the Family History.

The incidence of insanity of unspecified forms in the family history of all groups is indicated in Table VIII.

TABLE VIII.—*Incidence of Insanity in Family in Each Type.*

	Grade of defect.					Total.
	1.	2.	3.	4.	5.	
Early	0 (1)	1 (0)	3 (1)	1 (3)	2 (4)	7 (9)
Mild chronic	0 (1)	2 (3)	5 (2)	0 (5)	0 (1)	7 (12)
Deteriorated chronic	0	0	0 (3)	3 (4)	4 (8)	7 (15)
Chronic catatonic	0	1 (0)	2 (2)	2 (0)	3 (2)	8 (4)
Paranoid	0	3 (7)	2 (2)	0 (1)	1 (1)	6 (11)
Mixed	0	0	1 (1)	1 (1)	0	2 (2)

( ) = No insanity in family.

It requires little comment. A positive history was obtained in 37 out of the 90 cases, more or less according to expectations of schizophrenia. Out of 47 patients with Grade 4 or 5 defects, there was a positive family history in 17; the proportion of 20 out of 43 with Grade 1, 2 or 3 defects is somewhat higher. The testis condition cannot be related to any ascertainable family history of insanity. It was not possible to regard it as a taint of germinal failure in specific families, which under certain conditions might be transmitted along with a constitution susceptible to schizophrenia, as the histories show many of the patients came of large families —one had 14 brothers. The antecedent generations so far as could be discovered were normally fertile.

Relation of the Testis Defect to the Physical Constitution.

It has been claimed that a leptosomatic habitus is the physical constitution most commonly seen in chronic schizophrenia, and that a pyknic build is associated with a more favourable outcome (Kretschmer, 1934; Langfeldt, 1937).

The patients were divided into three broad groups—normal, leptosomatic and pyknic. Subdivisions were not considered useful, and all types that were not typically leptosomatic or pyknic were dubbed "normal." By design atypical, dysplastic types had been excluded from the case-material. Table IX shows the distribution. There was no correlation between testis state and physique.

Excretion of 17-Ketosteroids.

The output of 17-ketosteroids in urine, which is an index of androgenic activity, was determined in 73 subjects. This excretion product is derived from the male gonad and adrenal cortex—in normal adults about 5 and 9 mgm. per 24 hours respectively from each (Fraser *et al.*, 1941). Figures below 5 mgm. indicate a deficiency. It was hoped that some light might be thrown on the state of internal secretion, believed to be supplied by the cells of Leydig. The figures obtained in 73 schizophrenics and 20 others were divided into three groups: 0–5, 6–16, over 16. Between 6–16 probably represents normality. Very severe atrophy was found in a

TABLE IX.—*Physical Constitution.*

		Grade of defect. 1.	2.	3.	4.	5.	Total.
Early	L	—	1	2	1	3	7
	P	—	—	—	—	—	—
	N	1	—	2	2	3	8
Mild chronic	L	1	3	2	2	1	9
	P	—	1	1	2	—	4
	N	—	1	4	1	—	6
Deteriorated chronic	L	—	—	1	1	6	8
	P	—	—	1	3	1	5
	N	—	—	1	3	5	9
Chronic catatonic	L	—	—	1	1	5	7
	P	—	1	—	—	—	1
	N	—	—	3	2	—	5
Paranoid	L	—	2	3	—	—	5
	P	—	1	—	—	—	1
	N	—	7	1	—	3	11
Mixed	L	—	—	—	1	—	1
	P	—	—	1	1	—	2
	N	—	—	1	—	—	1
Total		2	17	24	20	27	90

L = Leptosomatic; P = pyknic; N = normal.

TABLE X.—*Excretion of 17-ketosteroids.*

Schizophrenics.

Mgm. per 24 hours.	Grade of defect. 1.	2.	3.	4.	5.	Total.
0–5	1	1	3	1	4	10
6–16	1	9	14	10	14	48
Over 16	—	6	3	3	3	15
Total	2	16	20	14	21	73

Non-schizophrenics.

Mgm. per 24 hours.	Grade of defect. 1.	2.	3.	4.	5.	Total.
0–5	—	—	1	—	2	3
6–16	1	5	7	1	1	15
Over 16	1	—	1	—	—	2
Total	2	5	9	1	3	20

significant number in this group, while a proportion of normal testes fell into the subnormal group. There was thus no correlation.

Discussion.

It has been shown that atrophy of the testis is characteristic of non-paranoid schizophrenia. Moreover, when severe in degree it is usually associated with the chronic deteriorated, when moderate with the mild chronic form. Allowing for some overlapping in both clinical and pathological grading, the statement that the degeneration of the testis is a measure of the severity of the psychosis is well founded and can be accepted. Slight or no defects were found in paranoid schizophrenia. It is tempting to regard this form as pathogenetically related to the others. It differs in that it is relatively non-progressive, or in other words, it becomes arrested and chronic before there is an extensive disorganization of the personality. It is therefore less malignant. For this very reason it can be accepted as related to the dementing forms of schizophrenia only with great reserve. If it be claimed that

all forms are causally related, then the state of the testis—little or a slight degree of atrophy—found in paranoid schizophrenia here takes its logical place. The onset of the paranoid illness after 25 prevents the exclusion of age as responsible for the slighter changes of Groups 2 and possibly 3 sometimes found. Although suggestive when compared with post-mortem normals and non-schizophrenics, it is not justifiable to attach as much importance to slight as to severe grades of atrophy; the most that can be claimed is that these are what one would expect if paranoid schizophrenia were pathogenetically related to the other forms.

Morse (1923), who examined a small number of post-mortem testes, found little or no abnormality in paranoid schizophrenia, and held that this invalidated the claims of Mott. This criticism can now be met, for as it here appears, atrophy was indeed not to be expected.

In the analysis catatonic schizophrenia was considered as a separate entity, because of its special characteristics, although the end state is usually extreme deterioration. The severity of atrophy could be correlated with the malignancy of the psychotic process as in other forms, and the association of severe testis atrophy with extreme deterioration still holds good. Remissions, sometimes for years, occur, and occasionally the illness is arrested at a rather high level. Grade 2 atrophy was found in only one chronic deteriorated patient, a catatonic. After being mute, degraded, dirty and troublesome for most of the eight years of his illness, he made an almost complete recovery after the operation of prefrontal leucotomy, and has since been able to earn his living at responsible work. Up to the present, at this hospital, his recovery is unique among patients of his type. It may be more than a coincidence that in this case a more or less normal testis was associated with a good ultimate prognosis. Apart from this case, not a single testis approaching normal was found in a chronic deteriorated subject, although Grades 4 and 5 atrophy were found in a few mild chronic and paranoid patients. This fact is all the more important when it is realized that, while the grading of the testis is of necessity arbitrary and tends to err on the score of leniency, and Grade 5 included varying degrees of severe atrophy, the deterioration of the chronic patients is much more absolute and in no possible dispute. It can be easily assessed. This establishes more certainly atrophy as an essential part of the deteriorating form of schizophrenia.

It has been shown that the age of the patient, the physical constitution, the family history of insanity, bear only the same relationship to this atrophy as they do to the psychosis in general. An early onset was usual in the more serious forms, and it was found to be similarly related to the severe atrophy. Mott (1919) and Tiffany (1921) both noticed that the most degenerated testes were associated with an early onset.

In describing the histological changes Mott (1919) paid great attention to the interstitial elements. He noticed and described extensive changes which were not to be seen in this biopsy material. As well, he observed severe degeneration of the seminiferous tubules, to which he attached less importance. As has been shown in the previous paper (Hemphill *et al.*, 1944) interstitial changes occur in the presence of a variety of bodily disorders and toxic processes. Very likely the already impaired testis of schizophrenia is unduly susceptible to such influences, so that a superimposed infection may produce a striking histological picture. Mott's results were criticised, and rightly, because other workers could show that interstitial changes, similar in type but not necessarily in degree to those he found could be attributed to physical disorders, in the absence of psychotic illness. Mott's principal contention was that as a result of the disorder of interstitial elements, there was a failure of production of internal secretion of the testis and male sex hormone at a time when the personality of the individual was beoming adjusted towards adulthood, and that in consequence the mental disorder was secondary to gonadal failure. Secondary sex characteristics had developed satisfactorily in the majority of the biopsy cases, and estimations of 17-ketosteroids done here have shown that at the time of biopsy the output of male sex hormone was well maintained, and not in any way proportionate to the histological condition of the testis. It is of course possible that, as a compensation, male sex hormone might, after an initial deficit, be supplied from another source, e.g. adrenal cortex. Be that as it may, the contention of Mott certainly is not true. The atrophy is to be regarded as a physical concomitant of the psychosis, due to a central abnormality responsible

for both. Castration and hypogonadism do not produce schizophrenia. In adults there may be little mental alteration after castration; when there is, it is usually an anxiety neurosis. The much-quoted descriptions of schizophrenia in Chinese eunuchs by MacCartney (1929) are not clinically convincing, and are contrary to all general experience.

Indirect confirmation of the severity and clinical significance of the spermatogenetic atrophy is provided by studies of fertility in schizophrenia. Kallmann (1938) investigated heredity and reproduction in the families of 1,087 schizophrenics. He found that "a qualitative biological distinction manifested itself very clearly between the hebephrenics and catatonics on the one hand and the paranoid and simple cases on the other." Fertility of the former two was very low, and of the latter two subnormal but much better; the paranoid type alone approached normal. According to the clinical classification used here, hebephrenia corresponds with "deteriorated chronic," and simple schizophrenia with the mild forms. Atrophy of Grades 4 and 5, and possibly Grade 3, renders the testis absolutely infertile, so the relative infertility described by Kallmann can now be explained.

It was not possible to obtain reliable seminal specimens for sperm counts and investigation.

Only five patients had been married, and possibly a few others had had offspring about which no reliable information could be obtained. Details of those married are as follows:

One early paranoid patient, Grade 1 testis, married, childless; 3 paranoids in Grade 2 married with children; 1 mild chronic, Grade 3 testis, married, had had two children, the second seven years before biopsy and three years before the onset of his psychosis. Significantly, there was no history of offspring from any patient in whom atrophy of Grade 4 or 5 had been found.

In mental deficiency of the higher grades, where there is not a manifest error of development of the gonads, fertility is high, and outside hospitals such individuals usually have large families. The testes of mental defectives examined here did not show atrophy even in a case of the fifth decade of low intelligence and extremely degraded behaviour, but where there was a superadded schizophrenic psychosis the usual atrophy was seen.

As a physical sign in schizophrenia, the testis change occurs early in the psychosis. It is of great importance to ascertain if it actually precedes the mental symptoms. This is naturally very difficult to show. Atrophy of the severest grade was found in some patients whose illness had not endured many months, and in some whose mental condition underwent marked deterioration thereafter. The youngest case of schizophrenia examined was 14½. Puberty was not complete, although he was physically advanced for his age; hyalinized tubules were found in various stages of atrophy, as well as others that were nearly normal and in fair activity. His mental state had been entirely normal until not more than four months before, and had fluctuated at short intervals before the florid schizophrenia appeared. It is highly probable that the testis began to atrophy before mental symptoms were noticed. In another case, aged 19, biopsy was performed at a time when schizophrenia was only suspected. He continued with skilled work in a government factory until he was certified and admitted to hospital nearly two years later. A second biopsy showed hyalinization of the basement membrane in various stages rather more marked than in the first specimen, but the picture may have been modified by treatment he had received (elsewhere) in the interim. His mental state has deteriorated since. In a third case, Grade 5 atrophy was found when mental symptoms were slight and recent. He left hospital and served as a sailor for nearly a year. There was a relapse and the mental state was rather worse than previously; the testis was the same. He has since, at his own request, left hospital somewhat improved. In a fourth case, aged 19, Grade 4 atrophy was demonstrated about six months after the onset of symptoms. There was a remission in three months. He left hospital apparently well, relapsed in six months and is now deteriorating.

It would be fair to say that atrophy of the testis seems to ante-date the mental change, and that it is rapidly progressive and may reach a serious stage before the psychosis is well developed. Later it probably increases, but evidently slowly, for as severe atrophy is sometimes found at 20 as in the worst kind of chronic patients at 30 or more. In the most long-standing there is little intertubular

oedema, and the shrunken testis shows comparatively little fresh hyaline change.

So closely related are the testis atrophy and the form of psychosis that in discovering the cause of the former a great stride will have been made towards solving the origin of schizophrenia.

It is not conceivable that "worry" and psychic disturbances, which Stieve (1930) has held responsible for atrophy of the testis, presumably through interference with hypothalamic regulation of endocrines, are here causative. The emotional indifference of the schizophrenic contrasts strikingly with the mental suffering of other psychoses and neuroses in which there is no testis abnormality. I have examined a few cases of prolonged impotence of psychic origin, and found no hyaline changes of the basement membrane; active spermatogenesis was present. The conflict and mental suffering in one of them was great.

The older writers believed that masturbation, by producing some sort of exhaustion in the young, caused dementia praecox. Mott (1919) inclined to this view, and more recently it has been suggested that masturbation, by making a constant drain on germinal cells, increases the demand for gonadotrophic hormone and may produce functional exhaustion of the pituitary (Reiss, 1940). This is certainly not borne out by this material. Among the early cases of Grade 5, one masturbated excessively, the others little or not at all. The same is true of the chronics; masturbation is the exception rather than the rule. It is probably seen more frequently in mania, neuroses and organic brain disorders than in schizophrenia.

It is impossible to assess the significance of sclerosis of vessels in the testis noticed in many patients irrespective of their age. Vasoconstriction of the peripheral branches of the brachial tree has been demonstrated in schizophrenia (Freeman and Looney, 1935), and other peripheral vessels, including those of the testis, may be involved (Cotton *et al.*, 1940). There is some evidence, although the facts are still in dispute, that deficiency of male sex hormone or an alteration in the balance of circulating androgens and oestrogens, amounting to relative deficiency, can cause intermittent claudication. Treatment with testosterone has been effective in some cases (Edwards *et al.*, 1939, 1941). Hormone estimations in a small series of schizophrenics or of so-called homosexuals, who were in fact suffering from schizophrenia, have shown an androgen-oestrogen ratio less than what is considered normal. Taking these scattered facts together, an endocrine origin of the vascular disorder is a possibility.

Since it was possible to exclude all exogenous known causes of gonadal atrophy, an endocrine disorder with inadequate gonadotrophic control seems the likely cause. The histology was in keeping with what is seen when gonadotrophic failure is produced through hypophysectomy. However, such a deficiency of gonadotrophic hormone must be qualitative, for the internal secretion was not consistently and seriously upset and interstitial cells were present in quantity; and relative, for tubular atrophy—although sometimes extreme—was never absolute, and in mild cases it did not progress beyond a certain point, thereby suggesting a moderate deficiency only.

It is conceivable that in early adolescence, when somatic growth is nearly complete and gonadal functions making more important demands on the pituitary-endocrine mechanism, some sort of endocrine imbalance occurs in pre-disposed individuals. Relative germinal atrophy would, therefore, follow, and there might be the associated metabolic and autonomic disturbances so frequently, and inconsistently, described in schizophrenia. If this is so, there is every reason to believe that other endocrine glands besides the testis would suffer, and the biochemistry of developing brain would be abnormal accordingly. Unless there was stabilization and restoration, irreversible changes would prohibit recovery, and deterioration would take place. It is common experience that with all methods of physical treatment in schizophrenia the prognosis is much more favourable if the illness has not endured for more than six months, but practically hopeless a year later.

The mental and emotional effects of an endocrine, or indeed almost any prolonged and disabling bodily disorder, are most profound when it occurs in adolescence, when the mental constitution is still plastic and more susceptible to influence. Whatever the cause, paranoid schizophrenia, with its onset in full maturity, represents a less widespread disturbance of the personality. The earlier the onset of

schizophrenia after puberty the less formed is the personality, and therefore regressive changes are apt to be greater. In the endocrine sphere we can expect that the results of imbalance at a period of physical change—such as exists between puberty and late adolescence—would involve in a complex way metabolic and other physiological functions. It is suggested here that it is the impact of this imbalance on susceptible and immature personality that produces the psychic symptoms of schizophrenia of early life. Hypopituitarism by itself before puberty is responsible for such types as Fröhlich's syndrome, with its rather special mentality, but not for schizophrenia. Lesions of the pituitary in adult life are often accompanied by mental change of various sorts, usually unspecific. It may be, as writers (Grinker and Serota, 1941) have tried to show, that the primary upset in schizophrenia is hypothalamic, or that the activating process is hormonal imbalance influencing a susceptible personality (Hoskins, 1943); but obviously many factors are at work, of which the endocrine, and the individual mental constitution capable of being influenced by the physical derangement, are of the highest importance. The enormous literature compiled by Lewis (1936) shows that a great variety of physiological abnormalities can be demonstrated in individual cases of schizophrenia and, although it is claimed in this study that one physical abnormality is almost constantly present, varying in degree with the malignancy of the psychotic process, it must be admitted with Lewis (1936) that " if it is ever established that distinct changes in structure or in the biochemical elements are constantly associated with any of the dementia praecox states, this will merely open the way to determine whether the alterations are predisposing factors or whether they precede or are the result of mental conflicts or symptoms, or whether they are both the result of some deep determinant."

The atrophy of testis can be accepted as reflecting one physiological abnormality, probably mediated by the pituitary or hypothalamus, which is an essential feature in the pathogenesis of the disorder. This would imply that an endogenous factor is the primary agent in the production of schizophrenia, and this to a large extent is in keeping with experience. Although claimed, it has never been shown with any certainty that environmental and situational difficulties—so important in the production of neuroses—are in any measure responsible for schizophrenia.

While atrophy of testis in schizophrenia is to be regarded as indicative of a complex derangement of the endocrine system causally related to the psychosis, insufficient is known of human endocrinology to ascertain its nature, and up to the present the elucidation of this disturbance is not practicable.

Testicular biopsy can be an aid to diagnosis. Hyaline degeneration of the basement membrane and the other signs of atrophy described, associated with mental alteration in young individuals, is strongly suggestive of schizophrenia. A perfectly normal testis should rule it out. For prognosis the combination of Grade 4 or 5 testis with mental change in the second decade is ominous, and degenerative schizophrenia is to be feared. As testis atrophy is a very early sign, biopsy should help in dictating treatment at a favourable period, without delay, when the diagnosis is in doubt.

Summary.

1. Atrophy of the testis with special histological features was found in a varying degree in biopsy specimens from the majority of 90 schizophrenics, but not in other psychotics and other mental cases.

2. It varied in severity with the malignancy of the psychosis, chronic deteriorated and chronic catatonic schizophrenia being associated with severe atrophy, mild arrested with moderate. Significant atrophy was not found in the paranoid form.

3. Every degree of atrophy was found in the series of early cases with duration of less than one year. In one case, aged 15, with duration of a few weeks there was most severe atrophy.

4. There is no relationship between the age of the patient, either at the time of examination or at the onset of the psychosis, and the severity of the atrophy, except in so far as an early onset is usually associated with very malignant schizophrenia.

5. The internal secretion of the testis appeared to be well preserved in most cases, and the excretion of the 17-ketosteroids bore no relationship to the degree of degeneration.

6. There was no correlation between physical type or family history of insanity and the state of the testis.

7. The atrophy is an integral part of the psychosis, and there is considerable evidence that it may ante-date the appearance of mental change. It was found in one boy, aged 15, only a few weeks after onset of mental symptoms. Biopsy, therefore, can be a diagnostic measure.

8. The disorder of the testis is not causative of schizophrenia, but is evidence of a complex central imbalance of which it is one sign. It is not related to mental trauma or masturbation.

9. It has been suggested that some endocrine imbalance with relative and qualitative gonadotrophic failure is responsible for the atrophy, and, operating in a susceptible constitution, for the schizophrenia. Relevant questions have been discussed.

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A PSYCHOMETRIC METHOD OF DETERMINING INTELLECTUAL LOSS FOLLOWING HEAD INJURY.

By W. R. REYNELL, D.M.Oxon., F.R.C.P., Major R.A.M.C.,

Psychiatrist at a Military Hospital for Head Injuries; Senior Physician, West End Hospital for Nervous Diseases.

ABOUT 15–20 per cent. of cases of head injury of moderate or severe degree are followed by persisting intellectual impairment, causing loss of efficiency often increased by psychoneurotic symptoms arising from such incapacity. Deterioration of powers of sustained attention, of recent memory and of emotional control are characteristic of post-traumatic states after severe head injury, but ignorance of the patient's previous capacity and personality makes it difficult to assess psychological and physical factors—to distinguish between the patient who is ineffective because he is neurotic and the one who is neurotic because he is ineffective —as a result of cerebral damage. Therefore any reliable index of damage to the " matrix of the mind " will be helpful in prognosis and in deciding disposal.

The method of testing for the presence of intellectual loss about to be described has been used by me at a military hospital for head injuries during the past eighteen months. It takes about 20–30 minutes to test a patient and appears to give results which are significant. The test is based on the assumption, now fairly well established by the work of Shipley (2), Brody (3), Babcock (1), Clark Conkey (4), Wechsler (5) and others, that certain abilities or attainments, such as vocabulary, general information, and powers of comprehension suffer less in deterioration than do such capacities as reasoning ability, attention, recent memory, and " relational thinking."

The method is one using a differential test score based on tests described in Wechsler's *Measurement of Adult Intelligence*. Differential testing for the presence of intellectual impairment has been described by the above-mentioned writers (1), (2), (3), (4), (5). Shipley (2) tested several hundred cases in private and state hospitals and 1,046 normals by measuring the discrepancy between scores on vocabulary and on an " abstraction " test. He concluded that " the vocabulary level of the early deteriorated patient is affected relatively slightly, but his ability to see abstract relationships declines rapidly."

Babcock (1) determined the mental age by a vocabulary test and compared this with the mental age assessed by a group of memory motor and learning tests, and used the difference between the two mental ages as an index of deterioration.

Brody (3) tested a large number of psychotics by estimating the discrepancy between the vocabulary score and the mean of five sub-tests and expressing the difference as a percentage of the vocabulary score. His conclusions were that such a test could be used as an adequate measure of dementia.

Clark Conkey (4) found that his results in testing cases of head injury agreed with Goldstein's in that all performance test scores were lower, and that diminished ability to perceive abstract relationships was characteristic of the patient with head injury.

Wechsler (*Measurement of Adult Intelligence*, 2nd edition, 1941) has claimed that cases of organic cerebral injury or disease showed lower scores on arithmetical reasoning, digit retention (forwards, and especially backwards), and " relational thinking " (similarities test) than in vocabulary, general information, and comprehension, and that such differences could be used as an index of intellectual impairment. He found that organic cerebral cases gave consistently lower scores in performance tests than in verbal tests, and that the best performance test was Block Design (Koh). Wechsler used a battery of ten tests, of which I have selected

six. Three of these, called the A Series, have all been found to " hold up " well in cerebral injury and disease; the remaining three—the B series—all tend to " fall away " in such conditions.

A. Series of Tests.

(From Wechsler—slightly modified for British subjects.)

1. *Vocabulary*—a list of 42 words of increasing difficulty, as follows:

1. Apple	15. Fable	29. Catacomb
2. Donkey	16. Brim	30. Spangle
3. Join	17. Guillotine	31. Espionage
4. Diamond	18. Plural	32. Imminent
5. Nuisance	19. Seclude	33. Mantis
6. Fur	20. Nitroglycerine	34. Harakiri
7. Cushion	21. Stanza	35. Chattel
8. Shilling	22. Microscope	36. Dilatory
9. Gamble	23. Vesper	37. Amanuensis
10. Bacon	24. Belfry	38. Proselyte
11. Nail	25. Recede	39. Moiety
12. Cedar	26. Affliction	40. Aseptic
13. Tint	27. Pewter	41. Flout
14. Armoury	28. Ballast	42. Traduce

Maximum score 42. Average 20–24. Any recognized meaning of the word is acceptable; if only vaguely known half credit is given.

2. *General Information*—25 questions graduated in difficulty:

1. Who was Prime Minister before Winston Churchill?
2. Where is London?
3. How many pints make a quart?
4. From what is rubber obtained?
5. What is a thermometer?
6. How many weeks are there in a year?
7. What is the capital of Italy?
8. What is the date of Armistice Day?
9. What is the average height of a woman?
10. Who invented the aeroplane?
11. How far is it from Paris to New York? (2,000–3,000 miles).
12. Where is Brazil?
13. Who wrote " Hamlet " ?
14. Who discovered the South Pole?
15. What is the Vatican?
16. What is the capital of Japan?
17. What does the heart do?
18. What is the population of Great Britain?
19. Who wrote *Pickwick Papers?*
20. Where is Egypt?
21. What is the Koran?
22. Who wrote " Faust " ?
23. What is Habeas Corpus?
24. What is ethnology?
25. What is the Apocrypha?

Maximum score 25. Average 13–14.

3. *General Comprehension:*

1. What is the thing to do if you find in the street an envelope that is sealed, stamped and addressed?
2. What should you do if while sitting in a cinema you were the first person to discover a fire (or see smoke and fire)?
3. Why should we keep away from bad company?
4. Why should people pay taxes?

5. Why are shoes made of leather ?
6. Why does land in the city cost more than land in the country ?
7. If you were lost in a forest in the daytime, how would you go about finding your way out ?
8. Why are laws necessary ?
9. Why does the state require people to get a licence in order to be married ?
10. Why are people who are born deaf usually unable to talk ?

Two or one marks are given for each answer that is correct or approximately correct (specimen answers of each kind are given in the Wechsler book to guide the examiner in marking all of the tests). Maximum score 20. Average 10–12.

B. Series of Tests.

1. *Arithmetical Reasoning :*

1. How much are four pence and five pence ?
2. If you have ten shillings and spend six, how much is left ?
3. Take 8 from 25.
4. If an orange costs fourpence, how many can you get for three shillings ?
5. How many hours will it take a man to walk 24 miles at the rate of 3 miles an hour ?
6. Take 14 from 50.
7. If seven pounds of sugar cost one shilling, how many pounds can you get for four shillings ?
8. A man bought a second-hand car for two-thirds of what it cost new. He paid £400 for it. How much was it worth new ?
9. Eight men can finish a job in six days. How many men will be needed to finish it in half a day ?
10. If a train goes 150 yards in ten seconds, how many *feet* can it go in one-fifth of a second ?

An extra mark is given for each of the last two questions if answered correctly within 15 seconds. Maximum score 12. Average 7–8.

2. *Digit Retention.*

The score is the total number of digits repeated correctly forwards added to the number repeated backwards. Maximum score 17. Average 7 + 5.

3. *Similarities.*

A list of 12 pairs of words designed to test the capacity for " relational thinking." for seeing abstract relationships. The patient is asked, " In what way are these two things alike ? " The pairs are : Orange—banana ; coat—dress ; dog—lion ; wagon—bicycle ; daily paper—wireless ; air—water ; wood—alcohol ; eye—ear ; egg—seed ; poem—statue ; praise—punishment ; fly—tree.

Responses are scored 0, 1 or 2, depending upon the degree and quality of the generalizations. A criteria sheet is used for evaluating the responses.

Maximum score 24. Average 12.

The Differential Test.

The patient's intelligence quotient (Wechsler's *Measurement of Adult Intelligence*) is assessed first on his performance on Vocabulary, General Information, and Comprehension (A Series of Tests), and again on his Arithmetical Reasoning, Digit Retention (forwards and backwards), and Similarities (B Series of Tests). The I.Q. is obtained by adding the three " weighted scores " obtained in each series of tests, multiplying by 5·3 (because the I.Qs. are calculated on *five* tests) and looking up the corresponding I.Qs. in the table at the end of the book. The B Series of Tests measures reasoning ability, attention, recent memory, and capacity for " relational thinking "—all of which " hold up " badly in cases with intellectual deterioration. If the difference between the two I.Qs. reaches double figures the result is considered as " positive " for intellectual loss. This is an

arbitrary figure, but it has been found to be one which is, in a great majority of cases, significant of intellectual impairment if the testing is done two months or more after injury.

The test is not difficult to apply by those with some experience in psychometric testing, but the reliability of such a method as a clinical instrument depends to some extent, like that of all clinical instruments, on the experience of the user. About 10 per cent. of cases with clinical evidence of intellectual loss may pass through the "sieve," but in doubtful cases other tests—especially Kohs' Block Design Tests and the Digit Symbol, which also "hold up" badly in association with intellectual deterioration, should be used as supplementary tests. Tests for "retardation," retentivity, reading comprehension, Test 33 (National Institute of Industrial Psychology), Cattell's Tests A and B, and others may be used in doubtful cases, especially in those of higher I.Q., before a final diagnosis of the presence or absence of intellectual loss is arrived at. In border-line cases it is important that the *result of the tests as a whole* should be considered in forming an assessment, but in a large majority of cases a positive result on the A and B Series is a significant "pointer," if the patient is tested two months or more after injury.

In more recent cases a positive result is less significant, and the discrepancy between the two test scores may later diminish or disappear. If the test is positive two months or more after head injury, the prognosis for further service in the Forces would appear to be poor—80 per cent. of 100 such cases were invalided as permanently unfit on general clinical grounds, whereas 80 per cent. of 90 cases of moderate or severe head injury which gave a negative result on the test were returned to duty.

Results of Testing.

Five hundred and twenty consecutive cases of head injury, of which 95 per cent. were "closed," referred for psychiatric examination and testing because their mental integrity, adequacy, or stability were in question, gave the following results. I have for simplicity taken the nearest round figure—e.g. 120 for 117, 300 for 303—rather than state exact numbers, implying a degree of accuracy unattainable in psychiatric cases, which inevitably overlap to some extent. Nearly 1,000 cases have now been tested, but the results of later cases have not been followed up and are not included in the following figures:

120 cases gave a positive result on the A and B Series, i.e. a difference of 10 or more between the I.Qs. calculated on the two series of tests. Ninety-five of these were cases of moderate or severe head injury.

300 cases gave no significant difference between the two test scores; 90 of these were cases of moderate or severe head injury (Group II).

100 cases were found to be "dull and backward," i.e. with Intelligence Quotient 60–85. The results of differential testing in these cases were not considered to be of great significance.

Of the 120 cases which gave a positive result on testing, 20 were recent cases, i.e. less than two months after head injury, some of which became negative later on. The remaining 100 cases (Group I) were tested two months or more after receiving their head injury, and of these 80 (80 per cent.) were invalided as permanently unfit on general clinical grounds, long duration of symptoms, absence of improvement with treatment, personality changes, etc. Of the 20 (20 per cent.) who were returned to duty—mostly in a lower category—10 were "euphoric," a condition which we have learned to associate with a bad prognosis, as many such cases subsequently return with headaches, depression, retardation, etc.

Of the 90 cases (Group II) of moderate or severe head injury, i.e. with post-traumatic amnesiae of a few hours up to six weeks, 72 (80 per cent.) were returned to duty. Of the 18 patients who were invalided from this group the great majority had been many months in hospital and had chronic "anxiety" symptoms.

It will be seen that, with two series of cases of comparable severity, of patients showing a positive on psychometric testing 80 per cent. were invalided, and of those showing a negative 80 per cent. were returned to duty. I am told by a statistician (Dr. P. E. Vernon), who kindly looked through my figures, that the chances of such a result being fortuitous are more than a million to one.

Analysis of differential and " weighted " scores was as follows :

	Average difference in I.Q. in A and B Series.	Average " weighted " scores.					
		A Series.			B Series.		
		Vocab.	Gen. inf.	Compr.	Arith.	Digits.	Similarities.
100 cases (Group I), 80 per cent. invalided as permanently unfit	14	11·7	11·0	11·6	9·9	7·9	9·8
90 cases (Group II), 80 per cent. returned to duty	2·1	11·4	11·0	11·8	10·8	10·8	11·5
" Control " group of 50 " psychoneuroses "	1·2	12·0	11·8	12·5	12·1	11·5	12·3

It will be seen that in the Group I cases there was a marked " falling-away " in the average score in each of the three tests of the B Series ; in the Group II cases there was only a slight discrepancy between the A and B Series, and in the Control Group there was no significant difference.

A deterioration in the ability to repeat digits *backwards* appears to be both frequent and significant in cases of intellectual loss. Thus the average number of digits repeated backwards by the Group I patients was 4·1, varying from 3 to 6, and of 40 " dull and backward " patients it was 4·0, with the same limits of variation. In a control group of 50 psychoneurotic and normal patients the average number of digits repeated backwards was 5·3, varying from 4 to 8. It would appear, therefore, that if a patient can only repeat four digits backwards it is probable that he is either dull and backward or he has suffered intellectual impairment.

A positive result on differential testing two months or more after head injury appears to be of greater significance in prognosis than a post-traumatic amnesia of one week's duration, which has been considered a criterion of " severe " head injury. In Groups I and II there were 40 cases with post-traumatic amnesia of more than one week. Of these, 20 (50 per cent.) were permanently invalided, and 20 (50 per cent.) were returned to duty (25 per cent. of these had post-traumatic amnesia of more than three weeks).

Of 80 cases of Group I which gave a positive result on the differential test (A and B Series), 80 per cent. were permanently invalided. Thus it was found that of cases with a post-traumatic amnesia of one week or more 50 per cent. were invalided ; but of cases giving a positive differential test two months or more after head injury, 80 per cent. were found unfit for further service. Symonds and Ritchie Russell (7) found that 60 per cent. of cases with post-traumatic amnesia of one week or more were subsequently invalided.

It is not suggested that such tests are a short cut to assessment of " total personality loss," which must always be made from a consideration of the whole clinical picture. Investigation of such loss is too complex a matter to be reduced to the comparatively simple methods of psychometric testing.

About 80 per cent. of all cases of head injury of all degrees of severity will show no clinical evidence of intellectual loss, and in such cases a negative result on testing will support a favourable prognosis arrived at on general grounds. Similarly psychometric evidence of intellectual impairment will give weight to an unfavourable prognosis indicated by general clinical assessment. It is often difficult to describe in words how much efficiency has been impaired, but if testing shows a performance say 15 per cent. below the average and perhaps 30 per cent. below what would be expected from the score on the A Series, we have some measure of the damage sustained. Furthermore, we have in such figures and performance on Koh's Blocks, etc., a standard by which to assess improvement, should this take place, thus providing a record of progress which is encouraging to the patient and an aid in treatment.

Results of Differential Testing in Cases of Cerebral Disease.

Five out of six cases of persistent headache after cerebrospinal meningitis gave positive results on testing with A and B Series. Ten cases of cerebral tumour,

five of chronic cerebral abscess, one of cerebral thrombophlebitis, one of acute "encephalitis" and one of subdural haematoma (of twelve months' duration) gave similar evidence of intellectual loss.

Results in Affective Disorder.

Of a group of 50 consecutive psychoneurotic cases who had had trivial or no head injury, 46 showed no significant differences in the scores obtained on the A and B Series. Purely affective disorders rarely show a positive on differential testing—although depressed and retarded patients will, of course, obtain poor scores on performance and timed tests, none of which is included in the A and B Series.

Besides giving indications of the presence or absence of intellectual impairment, psychometric testing provides in itself a valuable psychiatric interview. The great majority of patients are co-operative and willing to be tested and show an interest in the tests. Shyness and self-consciousness are soon lost, and much useful information may be gained by observing the patient at work, for instance, on Kohs' Block Design tests—the slow, patient, but effective plodder; the impulsive, slapdash, "accident-prone" individual, who seems not to realize or care much about his mistakes; the timid and hesitant; the over-confident; the irritable; the "catastrophic reaction" type; the tremulous; the dysmetric and clumsy; the careful planner with foresight; the carefree and careless with no plan and no foresight—all tend to give themselves away in a manner that might not occur in an ordinary face-to-face interview. Thus a good deal of information is gained about a patient's temperament, personality, and "reaction type" which is useful in the final assessment—whether the results indicate the presence or absence of intellectual impairment. In many cases of head injury, especially those of the "closed" variety, it may be more important to determine what kind of a patient has had an injury than the kind of injury the man has had. The latter must often remain indeterminate in the absence of positive neurological findings by X-rays, electroencephalography, air encephalography, and examination of the central nervous system. The length of the post-traumatic and retrograde amnesia often gives important information about the severity of the trauma, but this is not always a reliable index. Of 200 cases with post-traumatic amnesia of seven days or more no less than 50 returned to duty with no signs of intellectual loss on differential testing, and some of those with post-traumatic amnesia as long as six weeks were able to return to full flying duties.

Sgt.-Pilot V—, R.A.F., aged 24, had a post-traumatic amnesia of six weeks following an air crash with fractured skull. Tested eight weeks after injury: A Series 128, B Series 125. He returned to full flying duties fourteen weeks after injury.

Sgt.-Pilot S—, aged 27, had a post-traumatic amnesia of three weeks after an air crash with fractured skull. Tested ten weeks later: A Series 132, B Series 130. He returned to full flying duties.

Sgt.-Pilot S—, aged 20, had a post-traumatic amnesia of six weeks. Tested sixteen weeks after head injury (no fracture): A Series 129, B Series 127. Returned to full duty.

The patient's symptoms are manifestations of a psychosomatic reaction to an injury, and may be affected by (1) previous personality and adjustment to surroundings, home, and to life generally at the time of the injury; (2) the cerebral damage sustained (this cannot be accurately assessed, but air encephalograms, electroencephalogram and neurological examination, together with psychometric and psychiatric findings, may all give significant "pointers"); (3) all that has happened since the injury, memory of the circumstances (unless obliterated by retrograde and post-traumatic amnesia), effects of long stay in hospital, many investigations, "medical suggestion," possible, probable, or imagined effects of his injury upon his future life and capacity, "Y" listing, with consequent new unit, new work and companions, and a host of other factors, domestic, personal and financial.

The final assessment will be psychosomatic. Body, mind, and morale may all have been affected, and psychogenic and physiogenic factors are usually inextricably mixed. What we want to know is, "How much has this man been damaged?" and psychometric testing gives relevant information. We have no absolute criteria of "total personality loss," unless it be the patient's capacity to do the job he was doing before the injury and his capacity to do new jobs. Such tests

cannot usually be applied, and many factors, such as loss of confidence, "regression," and results of hospital life, make it difficult to reconstitute the *status quo ante* after a severe head injury.

It seems therefore that the most significant correlation of the results of psychometric testing is with the final disposal of the patient. As stated above, 80 per cent. of positive cases were found on general clinical grounds to be unfit for further service, and 80 per cent. of cases negative on testing (after head injury of moderate or severe degree) were returned to duty.

Doubtless the tests selected for the A and B series could be modified, added to, or improved upon, but it has been thought worth while to publish the results of using such a battery as a differential test in the hope that further research will lead to more efficient methods, and become more generally used in assessing the results of head injury.

It is important that the instructions given in Wechsler's book be accurately followed in administering the tests and in assessing the answers. I have made two or three slight alterations to suit British rather than American subjects (e.g., "Who wrote *Pickwick Papers*?" instead of "Who wrote *Tom Sawyer*?") in the general information test, and English money for dollars and cents in the arithmetic tests.

It is not supposed that reliable results will ever be possible without psychiatric experience, or that tests will be devised that can be applied by inexperienced persons and yield dependable results, but this applies to all clinical tests and not to psychometry alone.

A positive result on the A and B series—like a positive finding on air encephalography—may be taken as a significant "pointer" of cerebral damage, but a diagnosis of intellectual loss should not be made unless the result is confirmed by further tests of a more time-consuming kind. All such cases should be tested with Kohs' Blocks, digit symbol, Matrix, the Babcock sentence, Rey-Davis board and, at the higher levels, such tests as Test 33 of the National Institute of Industrial Psychology, Cattell's Test IIIA or B, and if necessary other tests before a diagnosis of intellectual loss is arrived at—the most significant of all findings in closed head injury cases.

Psychomotor activity may be increased or diminished—the patient may be garrulous and restless or depressed, retarded, unresponsive, and have "difficulty in thinking." Patients with "hypomanic" symptoms and those who were retarded and depressed, but who showed no evidence of intellectual loss on differential testing, almost always had personal or familial tendencies to such "reactions," and the prognosis was considered better in such cases than in those showing intellectual loss.

Retardation, or loss of speed in thought and action, is perhaps the most constant finding in post-traumatic impairment. Almost every case showing a positive on differential testing gave impaired scores on Kohs' Blocks, digit symbol, Test 33 and other "timed" tests. In a small proportion of cases this loss of speed was the only evidence of cerebral damage, but in my experience a large proportion of cases showing retardation of some months' duration gave a positive result on the A and B series, and on Test 33 or Cattell's IIIA or B gave results below what would be expected from the series (vocabulary, general information and comprehension) and by what would be expected from their educational and work record before the injury.

Retardation may be gross, but of short duration, and may give on superficial examination a false impression of intellectual impairment.

Pte. C. T— sustained a head injury in a motor-cycle accident. Post-traumatic amnesia four days. No fracture. His M.O. reported "very poor intelligence; it is impossible to get a reasonable history from him." He scored 50/60 on Raven's Matrix in 1½ hours, and on the A Series his I.Q. corresponded to 125. On Kohs' Blocks he did all the designs without difficulty, but took three times the standard time in doing them. This was only four weeks after his accident, and after another four weeks he showed no retardation and no intellectual loss on the differential test.

Considerable deformation of the brain, as shown by dilatation and alteration in shape of the ventricles on air encephalography, is compatible with little or no evidence of intellectual loss, as shown by the following case:

Pte. C—, R.A.O.C., clerk, aged 33, had a motor-cycle accident in 1939. He was unconscious seven days, with fracture of occipital bone. Post-traumatic amnesia seven days; retrograde amnesia two days. Returned to work six months later—same work, but with more responsibility. Was a keen amateur operatic singer in his spare time and continued to do this, although he gave up "producing." Four months after being called up early in 1943 he had "influenza" and two days later he developed *status epilepticus*. He had had two fits in infancy, but none since. Air encephalogram (6.vi.43) showed dilatation of both lateral ventricles, especially left anterior horn. Electroencephalogram was abnormal—"consistent with epilepsy." Psychometric testing: A Series 130, B Series 126, showed no evidence of intellectual loss. Block Design score corresponds to I.Q. 128. Raven's Matrix 47/60. Test 33 (N.I.I.P.) 150/193.

On the other hand, severe intellectual loss is often found after head injury without evidence of cerebral atrophy demonstrable by air encephalography. Nevertheless, the correspondence between positive results on differential psychometric testing and air encephalography was high in the cases I have investigated. Of 40 cases with abnormal findings in air encephalogram, 75 per cent. showed positive results on A and B series.

More than 90 per cent. of the cases in Groups I and II were cases of closed head injury. Only a small proportion of these—less than 10 per cent.—show neurological signs of cerebral damage. The following are examples:

Cpl. W. A—, aged 22; motor-cycle accident 10.x.41. Fractured parietal bone. Post-traumatic amnesia two weeks. Was symptom-free when returned to full duty 3.ii.42. Had increasing difficulty in doing his work as instructor; was forgetful and had fainting attacks. Readmitted 1.vii.42. Electroencephalogram abnormal. Air encephalogram indicated cerebral atrophy. A Series 135, B Series 119. Discharged Category E.

Drvr. W. B—, aged 22. Lorry accident 7.v.42. Fractured parietal bone. Post-traumatic amnesia seven days. 8.vi.42: Electroencephalogram normal. 18.vi.42: Air encephalogram indicated left cerebral atrophy. Patient garrulous and euphoric. A Series 116, B Series 104. Discharged to duty in Category C; prognosis doubtful.

Cpl. G. C—, aged 32. Car crash 17.xii.41. Left fronto-parietal fracture. Right side spastic. Post-traumatic amnesia seven days. Slight dysarthria. Poor memory. A Series 108, B Series 98. Block Design, reading comprehension and retentivity very poor. Discharged Category E.

A.C.1 D. C—, aged 32. Knocked out of boxing ring 13.viii.42. Unconscious some hours. Post-traumatic amnesia twelve hours. Followed by right-sided weakness lasting two days. Pupils unequal. 25.xi.42: A Series 107, B Series 88; Block Design 75. Discharged Category E.

Cpl. D. M—, aged 33. Motor-cycle accident 7.iii.42. Fractured right frontal bone. Post-traumatic amnesia three days. Discharged Category C 8.ix.42, but developed headaches on returning to duty. Readmitted 1.x.42: Knee and ankle jerks absent. A Series 120, B Series 99; Block Design 85; Matrix 21/60. Discharged Category E.

Tpr. R. I. M—, aged 23. Lorry accident 17.iv.42. Post-traumatic amnesia five hours. 30.viii.42: Bitemporal hemianopia. Electroencephalogram grossly abnormal. Right-sided anosmia. A Series 135, B Series 116; Block Design—complete failure. Patient is euphoric and feels perfectly well and fit for duty. Discharged Category E.

Neurological findings are often completely negative in cases of severe head injury, as in the following cases:

L.-Cpl. A. D—, aged 22. Motor-cycle accident 4.iv.42. Fractured base of skull. Tested 13.viii.42: Euphoric. Central nervous system, electroencephalogram, air encephalogram: All N.A.D. A Series 116, B Series 104; Block Design—was able to complete only three of seven tests.

Gnr. E. McL—, aged 36. Fell off lorry 12.vii.41. Fractured parieto-occipital region. Returned to duty in Category C, but developed headaches, was slow and depressed. Lost confidence. Poor memory. Readmitted 22.viii.42. A Series 96, B Series 84. Boarded Category E.

Gnr. F. M—, aged 32. Car accident 24.iv.42. Fractured frontal bone. Post-traumatic amnesia thirteen days. Electroencephalogram, central nervous system: N.A.D. Returned to duty five weeks after injury. Developed severe headache and was admitted for investigation 1.vi.42. A Series 123, B Series 102; Block Design 104. Symptoms cleared up and patient was returned to duty in Category C. Prognosis doubtful.

Personality Change.

Next to intellectual loss the most significant change following head injury is change of personality—some think that such change is even more important, but this is not my view—in any case it is more difficult to assess. The most frequent personality change is the "caricature" variety. The personality traits have not

been altered, but have become " more so," to the extent of a caricature; characteristics which were previously largely latent now become overt. In others the change is more fundamental—there may be an " inversion " of the personality, and the cheerful, sociable, alert person may become depressed, unsocial, and lacking in initiative.

In my experience personality change of severe degree and duration is almost always associated with intellectual loss, but I have no doubt that there are exceptional cases in which this is not so. After testing nearly 1,000 cases it is my experience that the two findings are closely associated, especially in those patients who show no obvious constitutional predisposition to affective disorders. Where such predisposition is present the personality change may be considered as a psychosomatic reaction which will clear up in the course of time, if no intellectual loss can be found on careful testing.

Discussion and Summary.

A differential test score method of detecting the presence of intellectual loss following head injury has been tried out and the results followed up in 520 consecutive cases. The test has been arranged so that, although it is simple and short enough to be carried out in 20–30 minutes, it provides a " mesh " fine enough to segregate most cases with definite intellectual impairment. About 10 per cent. of cases which on fuller testing with such tests as Test 33 (National Institute of Industrial Psychology), Kohs' Blocks, Cattell's Tests A and B, and the Raven Matrix Test, show evidence of loss, may fail to show a positive with the A and B series. In many of such cases which may give a history of severe head injury there will be clinical symptoms of euphoria, retardation, or personality change which indicate the desirability of more elaborate and time-consuming psychometric testing.

Intellectual abilities are of such variety and complexity that it is impossible to devise a battery of tests that will assess all of them, but for clinical use the tests must not be too time-consuming. Nevertheless, the A and B series—especially when supplemented by Kohs' Blocks, digit symbol, Raven's Matrix, and, if necessary, by Test 33 (N.I.I.P.) or Cattell's IIIA and B—do test a surprising number of faculties, e.g. memory, recent and remote, auditory and visual, verbal and non-verbal; synthetic and analytical capacities; reasoning; " relational thinking "; comprehension; and the four fundamentals of arithmetic (addition, subtraction, multiplication and division); visual imagery; constructive ability and speed—any or all of which may be impaired in post-traumatic states.

It is not to be assumed that the difference in the two test scores in the A and B series is a *measure* of intellectual loss, but such differential testing appears to give a fairly reliable index of the presence of deterioration—a conclusion which has been reached by a number of different investigators (Shipley (2), Brody (3), Wechsler (5), and others).

Psychometric tests do not indicate the presence of permanent intellectual loss, but the longer the period between head injury and testing the greater will be the significance of a positive finding, i.e. a difference of 10 or more in the two test scores. This figure of 10 or more is an arbitrary one, but has been found to be a reliable index of impairment in that 80 per cent. of 100 cases showing such a difference two months or more after head injury have been found on general clinical grounds to be unfit for further service in the Army or Air Force.

It should be emphasized that in making a diagnosis of the presence of intellectual loss the results of the tests as a whole should be taken into consideration; the A and B series usually gives an index of such loss when present, but this result should be confirmed by further testing with Kohs' Blocks, digit symbol, or other performance tests, and where necessary by such tests as No. 33 of the N.I.I.P., Cattell's Tests and Raven's Matrix.

The results of differential testing referred to above indicate that there is a high correlation between a *positive* result with the A and B series two months or more after head injury and *lowered efficiency* of a serious degree. The best index of a man's lowered efficiency is, of course, incapacity when returned to his usual work. This was found in a considerable number of cases, but in the majority this acid test of efficiency was not available. It was therefore necessary to judge the

validity of a positive finding by correlating this with the next best available index of lowered efficiency—that is, his fitness or unfitness for further military service. Eighty per cent. of 100 positive cases were on general clinical grounds found by Medical Boards, who were uninfluenced by the result of the A and B tests, to be unfit for further service. Further, it was found that 80 per cent. of cases which were negative by the same differential test—although all were cases of moderate or severe head injury—were returned to duty.

The validity of any clinical test will be judged by its correlation, high or low, with the total clinical picture. The results of psychometric testing have, in my opinion, a sufficiently high correlation with the total assessment—to establish its value in assessing cases of chronic head injury.

Conclusions.

1. Psychometric testing of chronic head injury cases is of value in diagnosis, prognosis and treatment.

2. The presence of intellectual loss is the most significant indication of cerebral damage. The longer the period between the head injury and the testing the more significant are the findings.

3. The results of testing should be considered as a whole in arriving at a diagnosis of intellectual loss.

4. A deterioration in performance tests, in arithmetical reasoning, in digit retention—especially backwards in memory—and in "relational thinking" ("similarities" test) is characteristic of head injury cases.

5. A simple differential test—the A and B series—which can be carried out in 20–30 minutes by an examiner with some experience of psychometric testing will serve as an index of intellectual loss in the majority of cases with such deterioration.

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MENTAL TESTS IN SENILE DEMENTIA.

By H. HALSTEAD, M.A.,
Mill Hill Emergency Hospital Psychological Department.

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IN a previous article (1) the writer gave the results of a scale of 25 mental tests on a group of 20 senile patients. When that investigation was completed the scale was administered to a second group of seniles (Group B), who were considered to be in a more advanced state of dementia than the first group.

The objects of the second investigation were:

1. To see which of the tests discriminated clearly between the two groups.
2. To find out what kind of results would accrue from a sample of patients who were grossly deteriorated and in the closing phase of life.
3. To collect information which might help to determine the presence or absence of organic impairment in younger people. In this connection the hypothesis was made that in senile dementia deterioration of brain tissue would be diffuse, and that results on most tests would be poor. At this level neurotic overlay might be expected to be comparatively slight, and an uncomplicated record of organic loss could be obtained.

The first part of the paper sets out quantitative findings. The second part consists of behavioural data with notes on technique and mental deterioration.

SUBJECTS.

These were 18 unselected senile dements, all uncertified. Their ages ranged from 70 to 83, the average being 76·1, almost the same as for Group A.

RESULTS.

A. *Tests.*—The scores of both groups on each of the 25 tests were set out side by side, and compared with each other on four different indices, viz. (1) the critical ratio of the score differences; (2) the percentage of loss suffered by Group B in relation to Group A; (3) the percentage of overlap in scores between the two groups; and (4) the percentage of subjects in each group who failed completely on any of the tests. Of these indices the most reliable is the percentage of loss in productivity shown by Group B, as the differences are obtained, not from average scores, but from the total weight of scores of both groups on each test. In order to arrive at the best assessment all four indices were taken into account, and Table I shows the discriminative value of the tests under the headings "Good," "Fair," and "Poor." With such small numbers (38 patients in all) score distributions are unreliable, but the tests starred gave a fairly normal distribution.

Both groups found little difficulty in Recognizing Photographs, Naming Months, and Packing Cubes in Box.

Knox Cubes, Porteous Mazes, Tapping, and Recall of Paragraph were difficult for all the subjects.

On the whole finer differences were obtained on the timed tests (scored in seconds), which, besides producing a wider dispersion of scores, measure efficiency (2).

When the tests were ranked in order of difficulty for both groups the two lists were different. After eliminating those tests with similar rankings the discrepancies showed that Group B experienced *relatively* more difficulty in Reversing Months, Repeating Digits Forward, Recalling a Paragraph, Naming Colours in Reverse, Arithmetic, and Porteous Mazes. In relation to Group A three tests were much higher in rank order, i.e. relatively easier; these were Naming Colours, Tapping, and Tracing.

TABLE I.—*Discriminative Value of the 25 Tests Between the Two Groups of Senile Patients.*

Good Discrimination.

* Picture Memory.
Reading Speed.
* Digits, Forward and Reversed.
* Colour Naming, Reversed.
Recall of Paragraph; immediate delayed.
Naming Months, Reversed.

Fair Discrimination.

Block Designs (Kent).
Vocabulary.
* Knox Cubes.
* Naming Birds.
* Arithmetic.
Porteous Mazes.
Recognizing Photographs.
* Sentence Memory.

Poor Discrimination.

Naming Months.
Naming Colours.
Tapping.
* Naming Animals.
Tracing Tests (2).
* Writing Tests (2).
Packing Cubes in Box.

N.B.—Tests marked * show a fairly normal distribution over the 38 subjects.

TABLE II.—*Approximate Mental Ages of Group* B *Patients on* 13 *Tests.*

Test.	Mental age.
Vocabulary	10·5
Naming Months	9·5
Arithmetic	8·0
Reading Words	7·0
Repeating Digits, Forward	7·0
,, ,, Backward	7·0
Sentence Memory, rote	7·0
Knox Cubes	6·5
Block Designs, easy series	6·0
Naming Months, Backward	5·0
Recall of Paragraph, immediate	5·0
,, ,, delayed	5·0
Porteous Mazes	5·0
Average mental age, 13 tests	6·8

Table II sets out the average mental ages achieved by Group B on 13 of the tests. The average age for these tests is 6·8 (median = 7 ± 1·5 years). The highest mental age, as one might expect, is on the Vocabulary Test—mental age 10·5. Between this and the worst tests there is a gap of 5·5 years. As far as test performance generally is concerned the average demented senile in this group was, therefore, little better than that of a child of seven.

B. *Subjects.*—Dealing now with patients instead of tests, the following differences appear between the two groups of seniles:

1. On the full scale (25 tests) there was a large gap between the median ranks of the two groups. The median of Group A was 13·77 ± 6·39, and that of Group B 23·58 ± 5·73, out of 38 ranks. The critical ratio of this difference is 3·72, which is decidedly significant. (P = 99 to 1.) The overlap in ranks between the groups was 20 per cent., i.e. eight cases were misplaced according to the test results.

2. The average loss of production from Group A to Group B on the full scale was 36 per cent., which is considerable in view of the advanced age of the patients in *both* groups.

3. The average percentage of failures on the tests was 22 per cent. in Group B, as against only 5 per cent. for Group A. The largest discrepancies in this respect were in Reversing Months, Recalling a Paragraph (both immediately and after a delay), Naming Colours in Reverse, and Arithmetic. There were no failures in either group in Repeating Digits Forward, Tapping, and Packing Cubes.

4. As far as variation of scores on the 25 tests is concerned, there was little to choose between the two groups, but there was a greater tendency in Group B for variability of performance to increase with age and with lowering of the general level of ability.

5. Group B showed a steeper drop in mean scores with increasing age ("r" = −·55 as against "r" = −·27 in Group A).

C. *Test-profiles.*—When the test-profiles of the 38 patients were examined it was found that no two were alike. This is to be expected, since, even at this stage of life, there is a dispersion of scores on each test, but especially on the timed tests.

In comparison with the adult male population generally the senile scores are low in every test, but individual differences are still present. It has been shown that "intelligence" ceases to develop earlier in people of low than of high intelligence, and the present study indicates that, in general, the decline of abilities is more rapid in the former, if the vocabulary score is used as an index of former level. But deterioration of brain tissue, though it may be diffuse in seniles, gives rise to different behaviour patterns, and it was not easy to predict how any patient would perform on a given test, unless he were so deteriorated that he could not comprehend the situation. The pattern and tempo of decay may be determined at conception, and modified by the life experience of the individual. In younger people, where variation of performance is greater, prediction is more difficult, and certainly less exact. Further, the concern of the psychologist is usually with intellectual impairment, which is only a part of the total picture. In any senile patient one could not deduce with confidence from the test records the state of emotional deterioration or lapse in personal habits.

Even in cases of known cerebral arteriosclerosis there are still considerable variations in score profiles, so that, although they may be grouped diagnostically, they cannot be so grouped in test performance. In Group B there were six cases, and their profiles differ widely from each other. Their rankings on the scale were 19, 21, 23, 26·5, 37 and 38, i.e. all in the lower 50 per cent. The average of these is not significantly different from the average of Group B, and their average age differs only by six months from that of the same group. The two poorest cases out of the 38 were both arteriosclerotic and both aged 80.

Observations on Tests.

It is an accepted fact that in senile decay memory is almost always affected, especially memory for recent events. For this reason the test scale was heavily weighted with memory tests both of rote and substance memory, in the visual and auditory spheres.

Visual Memory.

Experimentally it has been shown that recognition is one of the easiest tasks of memory, and might, therefore, be expected to show the slowest decline. In the test of Recognizing Photographs, however, a test which, in the form used, was found to be too easy for most adults to whom it was applied, the demented patients in Group B were poor, even in comparison with Group A. Only one patient obtained a full score, which is awarded for recognizing four pictures singly and then all four in order (8 points). The mean score was 6 points ± 1·5. In this group there was a good deal of indecision, confusion, and slowness, and in some cases the patient became haphazard or immobilized. In addition to the poor memory, retroactive inhibition and perseveration both played a part in confusing the patients. On the Picture Memory test, a card of ten familiar objects exposed for 30 seconds, Group B patients were markedly inferior. Three failed completely. The median score

was only 4 ± 2 objects recalled. The highest score was 7. Few seemed, on being questioned, to have been able to conjure up an image of the card once it was removed. In the worst cases the time of exposure was much too short for the patients to attend to more than a few items, and results showed that these were mostly on the top line. (There were two lines of five.) Retention was so fleeting that even these were lost almost as soon as the card was being taken from sight. Increasing the time made little difference to the results. The poor score reflects the slow comprehension, brief attention, and short retentive powers of the demented seniles.

Another visual test, Knox Cubes, in which the subject has to tap, from memory, a given number sequence, immediately after its demonstration by the examiner, showed up the narrow and fleeting visual span. The median score of 4 ± 1·5 indicated an ability to reproduce only a simple sequence of four taps. The impression faded so quickly that unless the patient made his attempt at once he had to guess. As the series increased in length or complexity memory of the early part faded during the demonstration, and led to confusion. This test, unless done by a "counting" method, which allows mental rehearsal, involves a kinaesthetic element as well as a visual. On inquiry it appeared that most of the patients used the visual kinaesthetic method.

Auditory Memory.

Rote or verbatim memory is usually easier than substance memory, of meaningful material. It measures attention and retentive powers, but not the active digestion involved in substance memory. Two rote tests were included in the scale, viz. Digits and Sentence Memory. Wechsler says (3): "Rote memory, more than any other capacity, seems to be one of those abilities of which a certain absolute minimum is required, but excess of which seemingly contributes relatively little to the capacities of the individual as a whole. The memory span for digits has the great merit of quickly indicating whether an individual has that relative minimum." The median scores for Group B patients were 5 ± 0·5 forward, and 3 ± 1 in reverse, a performance which, in younger people, would lead one to suspect feeble-mindedness, according to Wechsler.

In the test of Sentence Memory (rote) the percentage of loss shown by Group B patients was rather less than in digit span. Only half of the Babcock series was used, viz. ten sentences graded in difficulty. In this short series there was too sudden a jump from an average of 10 to an average of 20 words. In the shorter sentences Group B averaged 87 per cent. correct, i.e. only about 8 words verbatim (Group A, 96 per cent.). Doubling the quantity reduced this to 57 per cent., or an average of 10 words (Group A, 71 per cent., or 14 words). As the sentences became longer omissions and inventions increased, and in Group B jargon appeared. (In Group A it appeared only once, in the worst case.) Once the limit of verbatim memory has been reached the subject has to rely on substance memory and guessing. Apparently the saturation point had not been reached in Group A, as there was a tendency to get a higher percentage of words correct as the sentences increased in length. In Group B the limit had about been reached ("r" = + 0·2). If the verbatim memory for speech is so short "spatially" and temporally, it follows that the demented senile will have difficulty in following a conversation and will miss many points altogether. This is one reason why he makes so many inconsequential remarks. All test instructions had to be given slowly, and in many cases repeated.

Substance Memory was measured by getting the subjects to reproduce a 46-word paragraph, containing 20 "ideas," from memory. Few people can reproduce this amount of material verbatim, and, in practice, there is usually a combination of verbatim and interpretive recall. Most seniles fare badly on this test, but in Group B the median number of ideas reproduced was *nil*, and 11 patients failed completely. The best effort produced only 6 ideas out of 20. The total amount of material recalled immediately by all the patients in Group B was only 6·7 per cent. of the possible (Group A, 24·5 per cent.). After a delay of a few minutes the number of total failures in Group B rose to 15. In general, as far as the demented senile is concerned, spoken words seem "to go in one ear and out of the other." The total production of all Group B patients in the delayed recall test was a mere 4·2 per cent. of the possible (Group A, 20·3 per cent.).

Fluency.

It was known that senile dements were slow in their reactions, especially in thinking. Even old associations are affected, though less than recent ones. Four short " fluency " tests were given, viz. Naming Animals and Birds, Reading simple Monosyllabic Words, and Naming Months. The first three have a time limit of one minute ; the fourth is timed, but the limit depends upon the subject.

In Naming Animals and Birds Group B showed a loss of 33 per cent. relative to Group A. The median scores were only $7 \pm 5{\cdot}5$ and $6 \pm 2{\cdot}5$ in the minute respectively. The former group showed considerable blocking (pauses) both in length and frequency, and many repetitions, only a few of which were recognized as such by the patients. Perseveration from one test to the other occurred only in Group B, and then only in a few cases.

In Reading Words and Naming Months the demented seniles were very slow, and there was often difficulty in shifting from one word to the next, with some slurring and repetitions. A few of them tried to read the words as if they were prose.

The Vocabulary Test also deals with old associations, but this has been given a section to itself.

Psychomotor Tests.

The tests in this category comprise Block Designs, Tracing (drawing lines through dotted patterns), Writing, and Packing Cubes. All these tests were within the capacity of most of the Group B patients. The only failures recorded were on the Block Designs as the patterns became more difficult. The series used here was that designed by G. H. Kent (4) for younger children ; there are only four designs and no dual colour blocks are used. The chief features observed in this group of tests were slowness and tremors.

Vocabulary.

The Bellevue Vocabulary Test was used in this investigation because of the graded scoring and the good distribution of scores found in adults. It was preferred to a selective type of test because it evokes material which can be assessed both quantitatively and qualitatively. The Shipley Vocabulary Test was tried at first, but the form of the test was irksome to the patients ; they tended to confuse one line with another.

In the Inventive Test the subject is required to show, not only his acquaintance with a word, but also how it is used and what it means. There are many grades of definition, and a skilled examiner can tell in a few minutes whether he is dealing with a person of high or of low verbal intelligence.

Radosaka-Strzemeka (5) has given the genetic steps in the ability to formulate definitions, and adults become more or less fixated at one of these levels. In both senile groups all levels were manifest.

The person of good previous intelligence had not lost the ability to define *per genus* and *differentiae*, a process involving classification and abstraction. One senile dement said, not quite accurately, that a donkey was " An animal of the quagga species." Even at this level there are finer grades according to the nearness or remoteness of the class concept or the adequacy of the words used in defining.

Definition by synonym is usually indicative of good level and economy of words, e.g. " To bet " for Gamble.

A median level response is definition by use or properties, e.g. " You wear it," " You ride on it," etc. Here, again, there are qualitative differences, e.g. for bacon many patients said " You eat it." One patient preferred " You have it for breakfast "—a rather more concrete definition.

Definition by description of qualities seems, in adults, to be at a lower level, though Terman (6) places it higher than the last named, genetically, e.g. " It has four legs," " It is round and red," etc.

Definition by giving an instance is at a lower level still. One patient said for " Nuisance," " Well I am a nuisance." (Why ?) " Because I get in the way."

One of the more primitive forms is the ostensive definition or pointing out an instance, e.g. " That is a nail in the wall," or " This is an apple." If the patient has no example available he may be nonplussed.

Sometimes the subject has a vague idea of what a word means, but is unable to frame a definition, often saying that it is on the tip of his tongue. This happens fairly often with uncommon words, though it is not unusual to find a subject in difficulty in trying to define a common word such as cushion or nail. Inability to define words which are " known " is often indicative of seriously impaired function, since the breakdown involves old and familiar associations. One deteriorated patient, in trying to do the Vocabulary Test, either gave up the attempt to define a word or merely repeated the word to be defined, e.g. " A donkey, well it's a donkey, isn't it ? "

If a person is unable to make any score on a Vocabulary Test he is in a poor mental condition, i.e. if he is not suffering from a specific defect such as aphasia. The lowest ranking patient of both senile groups scored only one mark on the Vocabulary Test despite variations of technique. His sole definition was " Bacon—Oh, they don't eat it do they ? "

For ordinary clinical use the graded scoring of the Vocabulary Test is quite adequate, but for more careful assessments it is a good plan to appraise the definitions on a qualitative basis.

Testing Technique.

Taken individually, each of the tests in the scale is quite short, and the apparatus simple. Most of it consists of material typed on cards, one test to a card. These are easily carried, and form a useful adjunct to a clinical interview.

The test session started with interesting visual tests, such as Recognizing Photographs, and Picture Recall. These usually break the ice fairly well. After this the tests were varied, i.e. visual and auditory material alternating, with psychomotor tests interspersed. Fairly easy tests completed the session. Most of the tests are timed, and a stop-watch is a necessity if one is to compare any performance with the norms. The procedure throughout was standardized without being rigid. In addition to the test scores careful notes were made about each patient's behaviour, including remarks and conversation, as well as any oddities of performance. This is the clinical method of testing which teaches the examiner a good deal about a patient.

Mental Deterioration.

The investigation of senile patients brought out many points worth following up in other cases of organic impairment.

In the first place it showed the rapid decline of recent memory span generally and of substance memory particularly in old people. Every test in the scale demonstrated impairment, but it was possible to rank the tests in order of difficulty to bring out the different rates of decline (1). The clinical tester should have a series of age curves covering the greater part of life on a variety of tests. These would show graphically the mean scores and standard deviation (or similar measures) at each age. This would not be an easy task, but it would provide a quantitative criterion for clinical use.

Secondly, it showed the impossibility of assessing deterioration by short-cut methods. A variety of tests must be used to find the patient's strong and weak points. But this gives rise to difficulty, as, despite the known differential decline rates, individual test profiles differ widely, even in old age. This raises the question whether score patterns can be related to clinical syndromes. Wechsler (3) has attempted this task, but differential " diagnoses " based on his score profiles are not sufficiently clear; there is overlapping between different groups. It would seem impossible to obtain profiles which are mutually exclusive, i.e. which apply to one and only one type of case. One remedy seems to be the accumulation of " signs " as in a clinical diagnosis, or, say, in the Rorschach test.

Thirdly, it indicated the advisability of paying special attention to certain tests which are found to be awkward for most organic cases, extracting from them all possible information. Many researchers have used this method, chiefly in the study of categorical thinking applied to different kinds of material. Some of the memory tests in the present scale will repay more intensive investigation.

Finally, at the risk of being trite, one might mention again the difficulty experienced by so many organic cases in shifting attention from one activity to another.

This difficulty affects some activities more than others, but in each, the patient, having assumed a mental set, seems tied to it (" Stimulus-bond "), and the succeeding activities suffer in different degrees from an occasional lapse into some preceding test, to a complete inability to start a new one. This was frequently noted in the seniles, especially in Group B, both in and between tests.

In trying to determine the presence and extent of organic impairment the investigator may need to try several methods, and will benefit by trying them on different pathological types. He will also need behaviour norms for different ages. As Gesell (8) says, *à propos* of children, "A developmental diagnosis is essentially an appraisal of the maturity of the nervous system with the aid of behaviour norms."

SUMMARY.

1. A scale of 25 mental tests was given to a group of 18 demented senile patients (Group B) aged 70 to 83. The results were compared with those of a previous group (Group A) who were in a less advanced stage of dementia. All the tests differentiated between the two groups. Table I shows the various discriminative values of the tests.

2. Mental ages for Group B on 13 of the tests are shown in Table II. The median of these is $7 \pm 1{\cdot}5$ years.

3. When the average of all the test ranks of Group B was compared with that of Group A the difference was decidedly significant and there was only a 20 per cent. overlap. Other criteria, such as total production and percentage of failures on tests, also showed significant differences. There is little difference in " scatter " between the two groups of patients, but the more demented group show a steeper drop in scores as their ages increase.

4. There is little in common among the score profiles of all the 38 patients, nor among those of six cases diagnosed as cerebral arteriosclerotics.

5. Observations on test performances appear under the headings of Visual Memory, Auditory Memory, Fluency, Psychomotor Tests, and Vocabulary.

6. The senile investigation as a whole brought out a number of points relevant to the study of organic impairment; these are discussed.

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PSYCHIATRIC STATES IN 130 EX-SERVICE PATIENTS.

By HARRY STALKER, M.D.Ed., F.R.C.P.E., D.Psych.

Deputy Physician Superintendent, Royal Edinburgh Hospital for Mental and Nervous Disorders; Lecturer in Psychiatry, University of Edinburgh.

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ALTHOUGH by now many papers have been published on psychiatric cases occurring in the Forces in this war, few follow-up studies are available of cases discharged to civilian life. Lewis (1943) and Ferguson (1943) found that a considerable proportion of discharged psychiatric patients had required further medical treatment and had difficulty in resettling to work.

The present study is of 130 ex-service patients treated at the Royal Edinburgh Hospital for Mental and Nervous Disorders from the beginning of the war until the autumn of 1943. To keep the series homogeneous, patients who have been able to return to service, members of the Allied Forces, of the Merchant Navy and of the Civil Defence Services have all been excluded. Included, however, are 18 cases admitted direct from their units at the beginning of the war, when no military hospital was available; these cases were all discharged from the Forces, but have not been followed up; where this lack of follow-up would interfere with the numerical findings, these cases are separately listed. Excluded also are cases whose records are too brief for full analysis; these were often patients who received a "diagnostic interview" only. If all the groups of excluded cases were added to the total it may be presumed that altogether about 250 cases have been seen. Therefore the problem of ex-service psychiatric cases is now becoming a big one for civilian hospitals, but it will be seen later that many were under treatment before their service.

This series is a selected one, as it includes only those so seriously affected as to require specialized psychiatric treatment. Otherwise it is a representative series, including in-patients of the two mental hospitals, the Jordanburn Nerve Hospital and the private nursing homes and including out-patients. A numerical method—it hardly deserves the title statistical—has been employed to bring out the various factors. A careful reader will find some slight apparent inconsistencies in the figures; these are not errors, but are due to cases being switched into different groups for different reasons which are sometimes explained to show their validity. Sixty-six of the cases were personally treated by me. Some of the patients in this series have been previously reported by Service writers or from this hospital in some non-military connection.

Nature of the Group.

There were 110 men and 20 women; 83 had been in the Army, 11 in the Navy, 1 in the Marines, 14 in the Air Force, 1 in the R.A.F. Regiment and 20 in the Women's Auxiliary Services. Rank was noted as the highest attained, not that on discharge; Naval and Air Force ranks were entered under the Army equivalents where possible. There were 1 captain, 5 lieutenants, 1 sub-lieutenant, 2 W.R.N.S. officers, 1 skipper R.N.R., 6 sergeants, 7 corporals, 9 lance-corporals and 98 privates. Of the 9 officers, no fewer than 5 were medical officers. Age, when seen by us, ranged from 18 to 40, with 8 patients of 43–53, all of whom had served in the last war and 2 of whom had been discharged in that war as psychiatrically unfit.

Family History.

In 8 cases there was no record of this. In 36 cases a family history of psychiatric disorders was denied. In 86 cases a positive history was obtained, 185 relations being affected, as follows: 80 parents, 30 siblings, 3 offspring, 15 grandparents, 40 uncles or aunts, 3 great-uncles or aunts, 8 first cousins, 3 first cousins once removed, 2 great-grandparents and 1 nephew. The psychiatric conditions reported were: General paralysis 1, manic-depressive reactions 6, involutional melancholia 1, undifferentiated depressions 3, schizophrenia 2, undifferentiated psychoses (in most cases the affected person was in a mental hospital) 13, suicide (not included under other headings) 4, mental deficiency 8, acute organic reaction 1, idiopathic epilepsy 4, traumatic epilepsy 1, chronic alcoholism 39, other psychopathic states 19, anxiety states 4, psychoneuroses not differentiated 15, psycho-somatic diseases 15 (strokes 2, hypertension 1, cerebral arteriosclerosis with depression 1, migraine 1, asthma 5, duodenal ulcer 3, stammerers 2), nervous temperament 49. By nervous temperament is meant a definitely abnormal personality, which often almost amounted to a clinical disorder but which had not usually been treated medically. Often the use of this term was founded on an interview by the psychiatrist with the person concerned. A typical example is a father who could never settle long in one place and had worked in Scotland, South Africa and Canada. He frequently suffered from headaches, depression and sleeplessness, as a result of which he would get up during the night and go for walks. He was a total abstainer and was intolerant of others taking alcohol; he was strict with the patient, quick-tempered, often struck the patient as a child, and often told the patient he was stupid or "lacking." The son was afraid of him and could not confide in him.

The high proportion of chronic alcoholics in the family histories may perhaps have some relation to the frequency of psychopathic states in the patients reported.

Consanguinity was present in 2 of the cases with a positive family history; 7 patients (6 with an otherwise positive family history) were illegitimate (5 psychopaths, 1 paranoid and 1 psychoneurotic).

Father's record in the last war.—In a paper on conscientious objectors with psychiatric states (Stalker, 1942), it was found that the fathers' records in the last war had usually been very uninspiring if not abnormal. A similar finding could not be demonstrated statistically in this series. However, where the father was a conscientious objector, in a reserved occupation, medically unfit for service or suffered from psychiatric symptoms alleged to be due to service, such things might in individual cases prejudice the son's adaptation to service in this war.

Degree of Predisposition.

Of the 130 cases, 55 should have been rejected by the ordinary Recruiting Medical Boards on the facts of their histories—in most cases, of course, these facts were concealed by the patient. If the suggestion of Henderson (1940*a*) had been adopted that all recruits be asked to present a statement of their previous medical history endorsed by their own doctor, these cases would have been easily excluded.

Previously treated for psychiatric symptoms: by own doctor or in psychiatric out-patient departments	14
,, ,, ,, ,, in general hospital	5
,, ,, ,, ,, in special psychiatric or mental hospital	11
Known mental defective	3
,, epileptic	2
,, (peptic ulcer 2, nephrectomy 1)	3
Previously discharged unfit from the Forces	5
,, unfit on recruiting examination in peace-time	1
,, found guilty in Court of criminal offences	7
Alcoholism and prostitution	1
Practising homosexuals	2
Recognized as general paralytic a few days after enlistment	1

These figures are no reflection on the Recruiting Medical Boards in this area. Many of the patients joined before the war, and many were examined in other parts of the country. In fact, in this area informal arrangements exist for reporting to the Medical Boards on at least a proportion of the known psychiatric cases (Stalker, 1941). I take the blame for recommending two of the above cases for modified service; they should have been found totally unfit on recruitment.

A further 47 cases were sufficiently predisposed to have been recognized on psychiatric examination at recruitment had such an examination been available:

Mental defect not previously ascertained	3
Psychopathic behaviour (including alcoholism and/or drugs 4)	8
Homosexuality not overt	2
Early schizophrenic or paranoid development	3
Poor work record and a number of psychiatric symptoms	7
Many psychiatric symptoms	24

To illustrate, this case was considered to have many psychiatric symptoms:

The patient said that his whole life was motivated by fear, and that his volunteering for service was an escapist idea and was an attempt to justify himself. As a child he was afraid of frogs and would not go fishing; of Santa Claus and had to be taken out of Christmas parties; of the dark and had a night-light until he enlisted. He had bed-wetting to age 7, and occasional hypnagogic illusions into adult life. At school he was teased and was poor at games. At work he occupied a subordinate position and "was generally kicked about and made to do the dirty jobs." All his life he was introspective about his personality generally, and especially about his fears, his shyness, the state of his feelings, sexual conflicts, his impossible ambitions and his desire to distinguish himself. "I have lived in my imagination all my life; I have never felt myself; I have never enjoyed life; I feared everything and everybody; I had an inferior face and people at home looked away from me."

There remain only 28 cases who could not have been excluded by psychiatric examination on recruitment, although in retrospect one can find some slight abnormalities in their personalities.

In estimating the degree of predisposition in this way the family history was not unduly emphasized. One then finds that of the 36 cases with a negative family history the degree of predisposition was less:

	No record.	Negative family history.	Positive family history.
Should have been rejected by Medical Board	5	13	39
Would have been rejected by psychiatrist	3	10	32
No gross predisposition	0	13	15

Curran and Mallinson (1940) also found that the family history was important in estimating the predictability of breakdowns in the Services.

Motives for and Methods of Joining.

Sutherland (1941) found that the proportion of conscripts was surprisingly low and that the motives of the volunteers for joining were often unsatisfactory. Both these findings are confirmed here. Only 38 patients were conscripts; 20 belonged to the Regular Services or Reserves; 20 to the Territorial Services; 48 volunteered after the outbreak of war; 1 was a conscientious objector who accepted non-combatant service; and in 3 cases there is no record of the method of joining. The high proportion of volunteers in this series is probably due to their unsatisfactory motives for joining and to their concealment of their psychiatric states.

Of the 88 voluntary enlistments in all, in 22 the motive is not recorded; in 26 the motives were apparently satisfactory; the remaining 40 had unsatisfactory motives, e.g.:

Because unemployed	6
To learn a trade	1
Dissatisfaction with civilian employment	3
To get into congenial unit	1
Because friends joined	6
To improve their psychiatric states	7
To avoid sentence in Court	2
Rows or unhappiness at home	9
To wear uniform	1
On psychopathic or defective basis	4
	48

Length of Service.

The figures—which include time spent in military hospitals—show the short service of the group on a whole:

Up to 1 month	10	Up to 15 months	7
„ 3 months	12	„ 18 months	9
„ 6 months	24	„ 2 years	15
„ 9 months	14		—
„ 1 year	15	Total to 2 years	31
Total to 1 year	75		

Up to 2½ years	9
„ 3 years	10
„ 3½ years	2
„ 4 years	1
Total to 4 years	22

No record 2.

Type of Service.

100 patients served at home only; 15 in France and the Low Countries; 3 in the Middle East; 1 in both France and the Middle East; 5 at sea; and 1 each in Gibraltar, Iceland and India; 3 were aircrew, but none were on operational flights; 89 patients saw no action whatever, not counting trifling air-raids. In one case there is no record of this. 40 saw some action:

Big air-raids at home or abroad (this no more than millions of civilians experienced)	26
Fighting in France	9
„ „ plus a little air-raiding in the Middle East	1
Ambushed in Palestine pre-war plus a little air-raiding in France	1
Shipwreck survivor—four days in Carley float	1
In Bismarck action	1
Prolonged service at sea with much action	1

Some patients who were in France or at sea saw no action whatsoever. Only one patient gained a decoration. The number who served overseas is so small that it is not profitable to extract them from the general group for special analysis. It implies, too, that breakdowns on active service are more recoverable, the patients being retained in the Services or in less need of treatment after discharge. As time goes on this, of course, may become relatively less the case.

Ordinary Illnesses and Accidents During Service.

Minor illnesses, such as colds, gastritis and scabies are excluded. One case of duodenal ulcer is excluded as this is entered as the " psychiatric " diagnosis:

None	93
Head injury alleged by patient but no evidence thereof	4
No record	3
Illnesses and accidents occurred in 30 cases—2 double entries:	
Mastoid operations	2
Other E.N.T. operations	4
E.N.T. conditions without operations	2
Operations (chronic appendix 1, acute appendix 1, pilonidal cyst 1, haemorrhoids 2)	5
Nocturnal enuresis	1
Cerebrospinal meningitis	2
True concussion	4
„ „ with fractured skull	3
Dysentery (type unknown)	2
Duodenal ulcer	1
Prolapsed intervertebral disc	1
Malaria	2
Bronchitis	1
Bronchopneumonia	1
Motor cycle accident with non-bony injury to back	1

Wounds or Injuries by Enemy Action.

There are very few of these.

No record	1
Alleged head injury, but no evidence thereof	1
None	123
Four days in Carley float, barracuda bite, no food or water, oedema of feet and salt-water boils	1
Wounds of limbs from shrapnel, etc.	4

Family or Business Anxieties during Service.

Even these factors were not very common—a further indication of the endogenous nature of the illnesses of the patients:

No record	2
None	98
Present (6 double entries)	30
Parents or wife seriously ill or died	14
Financial (1 summons in the early weeks of the war)	6
Wife confined (with special reasons for anxiety)	3
No letters from home	1
Wife of poor intelligence, hence apt to do things wrong	2
About spouse's fidelity	1
Spouse suspicious of patient's fidelity	1
Delusions of spouse's infidelity	3
Brother in trouble	1
Child delinquent	1
About wife evacuated to U.S.A.	1
About possibility of air-raids on family	1
Married unknown to parents	1

Sutherland emphasized the importance of "separation anxiety" in military cases in the form of a basically insecure attitude towards the outside world and of excessive dependence on the family. In addition to the above 30 cases who mostly had some cause for their anxiety, another 17 cases showed psychopathological evidence of separation anxiety.

Military Crimes.

No record in 10 cases; no crime in 92 cases; present in 28 cases with 1 double entry. One case of attempted suicide and several cases of absence without leave were excluded, as they occurred on a purely symptomatic basis.

A. Crimes not discovered or not dealt with as offences in the Services:

Practising homosexuality	2
Stole and used morphia for himself	1
Drew family allowance unlawfully	1
Petty arson	1
Assaulted comrades	1

B. Crimes dealt with in the Services:

Petty routine charges	2
Drunkenness (had to resign commission 1, court-martialled and discharged 1, reduced to ranks 1)	4
Court-martialled, imprisoned and discharged for homosexuality	1
Dismissed the Service for theft	1
One month in military prison for assaulting officer	1
Reduced to ranks for assaulting civilian lorry driver	1
Civilian traffic offence in military vehicle	1
Enlisted as a single man, failing to maintain his family	1
Absent without leave	9
Various offences by one person	2

The types of cases guilty of the offences showed the distribution one would expect: Psychopathic states 17, mental deficiency 1, schizophrenia 5, manic-

depressive reactions 2, post-traumatic psychosis 1, symptomatic epilepsy 1, anxiety state 1.

Emotional Events during Service.

This covers events not grouped under previous headings and includes both personal and military events; 39 patients were involved with four double, one triple and one quadruple entries.

Sexual (not merely events, but all involving anxiety or conflicts)	15
Hiding illiteracy	1
Special emotional difficulties in adapting to Service life	6
Anxiety over responsibility of promotion	2
Relations prisoners of war	2
Innocently involved in misuse of petrol by others	2
Saw one comrade attack another with a knife	1
Found comrade attempting suicide, who died soon after	1
Disagreement with superior officer	1
Seeing superior officer break down nervously in air attacks	2
Seeing brother in danger	1
,, comrades killed in air-raids	8
,, civilians killed in air-raids	4
Grave risk of aeroplane crashing	1
Other	1

Diagnoses.

These cover the whole range of psychiatry, with a very great predominance of the psychopathic states and with no obsessional neuroses.

Manic-depressive reactions (manic 1, depressed 5, mixed 1, reactive depressions 3)		10
Obsessive-depressive reaction		1
Schizophrenia (simplex 5, catatonia 5, hebephrenia 2, undifferentiated 4)		16
Acute schizo-affective reactions		4
Paranoid reactions		7
General paralysis		1
Symptomatic epilepsy		1
Post-traumatic (epilepsy 1, psychosis 1)		2
Idiopathic epilepsy		4
Post-encephalitic Parkinsonism		1
Mental defect (certifiable, and usually accompanied by depression, hysterical fits, etc.)		6
Psychopathic states		45
Predominantly aggressive types:		
Sex variants	7	
Alcoholism and/or drug addiction	11	
Epileptoid	4	
Other delinquent types	1	
Suicidal types	2	
Predominantly inadequate types:		
Psychotic personality types	5	
,, ,, ,, with transitory psychotic episodes	2	
Neurotic types	6	
Petty delinquents	5	
Others	2	
Psychoneuroses (anxiety states 19, mixed anxious and hysterical states 3, hysteria 4, hypochondriasis 3, anxiety states in intellectually retarded persons 2)		31
Duodenal ulcer		1

Symptomatology Related to Service Experience.

This was found in 30 cases.

Related to ordinary, not combatant service :

Dreams of (unexperienced) fighting	1
Functional continuance of symptoms of organic illness in service	3
Delusions and/or hallucinations related to service life	9
Emotional problems in service continuing	3
Masqueraded in uniform after discharge	2
Several in one case	1

Related to combatant service :

Battle dreams	6
Functional continuance of wound symptoms	1
Battle delirium in pneumonia after discharge	1
Fear of aeroplanes	1
Several in one case	2

Work Record since Discharge.

The total incapacity for work on medical or other grounds was recorded in each case; exact figures were usually available, but sometimes only an approximation which was known to be fairly accurate. For comparison the duration of all cases from discharge from the Forces to the date when last seen is also given, and here the figures are exact. It is clear how much incapacity the patients suffered—more probably than that found by Lewis or by Ferguson, whose cases were selected differently.

	Incapacity.	Duration of follow-up.
No record	3	3
No incapacity	11	..
Up to 1 week	1	1
,, 1 month	20	8
,, 3 months	30	15
,, 6 months	9	9
,, 9 months	16	18
,, 1 year	18	14
,, 1½ years	14	20
,, 2 years	4	14
,, 2½ years	1	11
,, 3 years	2	13
,, 4 years	1	4

The number of jobs held by individual patients was also noted :

No record	7
1 job continuous or with little absence	10
1 job terminated or with much absence	13
1 job continuous after long initial incapacity	10
2 jobs	18
3 jobs	4
4 jobs	6
6 jobs	1
10 jobs	3
16 jobs	1
18 jobs	1
" Several " or " numerous " jobs	10
No jobs (cases admitted here direct from Forces)	18
,, (cases last seen less than 6 months after discharge)	10
,, (cases last seen more than 6 months after discharge)	18

Comparison of pre-war and post-service occupations shows the downhill tendency in the group as a whole—as found by Lewis already. Where possible,

members of the Regular Forces are entered under their pre-enlistment occupations. One person of independent means is entered as unemployed, as she would work in wartime if she were able.

	Pre-war.	Post-service.
Medical practitioners	5	3
Solicitor	1	0
Independent means	1	0
Small business of own	3	2
At school, student or probationer nurse	3	4
Dress designer 1, golf professional 1	2	0
Clerical workers	12	11
Skilled workers, including apprentices	25	13
Semi-skilled workers	11	15
Domestic, institutional and catering workers	12	5
Shop assistants and 1 traveller	11	3
Unskilled workers	29	17
Regular officer	1	..
Regular N.C.O's. and men	5	..
Mostly unemployed	9	10
Cases admitted direct from Forces	..	18
Totally unemployed	0	28
No record	0	1

It was surprising to find that in only 10 cases did we use the Interim Scheme of the Ministry of Labour for the Rehabilitation and Resettlement of Disabled Persons because we generally use the Scheme a lot and find it helpful. Many cases were excluded by being treated before the Scheme was introduced, by being still in hospital or by being already in suitable employment. The Scheme had been utilized in some other cases before we saw them, but again relatively few cases, because many were discharged from the Services before the Scheme was introduced.

Another indication of the lowered working capacity of the group is the time spent in hospital. Only 41 cases were treated as out-patients alone. 18 cases were admitted while in the Services; a further 71 were admitted after discharge. This is a high figure and is partly due to psychotic cases; some neurotic cases were admitted because their homes were away from a medical centre and others because of the acuteness of their symptoms. Of the 89 in-patients 66 were in hospital for periods up to 6 months and 23 for periods from 6 months to 4 years. The time of hospital incapacity is, of course, included in the total incapacity recorded above. Many of the in-patients required follow-up treatment as out-patients.

Circumstances of Discharge.

This series is a comprehensive one in that it includes a number of patients who were not discharged under the label of psychiatric disability, but in some other way; 8 patients were discharged for ear, eye, or foot disabilities, bronchitis or combinations of these and 1 for wounds. In retrospect, it is probable that the symptoms associated with these disabilities were at least partly psychiatric in origin. Two were discharged for duodenal ulcer; in one this was not confirmed in a civilian hospital. It must be acknowledged that these diagnoses sometimes depended upon the patient's statements only, but none of them appeared to have been examined psychiatrically in the Forces. Six patients were court-martialled and/or discharged for theft, alcoholism or homosexuality. Three patients were discharged as volunteers (two females and one in air-crew training). One man was disbanded from the National Defence Corps. One was placed on light duties for psychiatric reasons and later released to Class W Reserve.

It has been alleged that a discharge from the Forces on psychiatric grounds is an easy way out for the malingerer. No evidence of this was found in these patients, who all required further treatment after discharge. Admissions of malingering were obtained from two patients. One exaggerated residual symptons of cerebrospinal meningitis, but he is a chronic alcoholic who has required frequent admissions to an observation ward since discharge. The other did his best to fail a flying test after losing his nerve in what was almost a crash and was released as a volunteer,

he is a psychopath with numerous disorders of behaviour. Neither of these patients was seen by a military psychiatrist.

The group of 18 patients who were admitted in the early stages of the war have been commented on by Henderson (1940*b*). He " brought out the waste of man-power resulting from the short-sighted policy of discharging all those who have been incapacitated as a result of a nervous breakdown, especially men who have been certified as mentally unsound. . . . A large number of wartime cases exhibit transitory episodes from which they recover quickly. There is no reason why they should not be efficient in one or other branch of the Services. The breakdown can be regarded as a failure of adaptation to difficult and strange conditions, and once that trouble has been overcome there need be no further difficulty." These comments of course applied to the early stages of the war, before the military psychiatric services were developed.

Desire to Return to the Services.

Whereas writers from military hospitals report that many of their patients desire to return home and that the patients claim that they will be better once they are home, quite a proportion of discharged patients express some desire to return to the Services. This is a contradictory statement on their part, and is probably an expression both of the restlessness and changeability of psychiatric patients and of their feeling that a change of surroundings will relieve their symptoms; 37 patients expressed this wish, 73 did not and in 20 cases there is no record. The statements of the 37 patients can be analysed in this way: In 2 cases it was an idle threat; in 5 cases it was an idle threat, whose idleness was confirmed by a co-existent claim of unfitness to serve in the Home Guard or to perform Civil Defence Duties; in 12 cases a wish to return was expressed, but its sincerity could not be judged, most of these patients being still in hospital when last seen; in 4 cases a wish to return was inferred from delusions or from masquerading in uniform. Apparently sincere desires to return were expressed by 14 patients, of whom 7 went to Recruiting Boards or other authorities in an attempt to re-enlist, and of whom 2 others actually served in the Merchant Navy, one for six weeks, and one for three years who is still serving.

Behaviour Disorders.

Slater *et al.* (1941) found that many " war neurotics " had been social misfits all their lives and that their neurosis was the expression of failure to adapt to the Army; their asocial activities in hospital were usually childish; they defied discipline or broke bounds without reasonable gain; they showed a marked hostility during treatment in hospital. Sutherland wrote " exemplifying the underlying psychopathic trend . . . (of many ' war neurotics ') . . . were frequent breaches of regulations."

In this series, disorders of behaviour were disturbingly frequent, but a comparison of the pre-war and post-service figures shows that they were fairly frequent before the war.

	Before the war.	Since discharge.
No record	3	4
Not applicable (mostly still in hospital when last seen)	..	25
No behaviour disorder	76	43

Delinquencies before age 14 were not included in the pre-war figures. No disorders of behaviour occurring during in-patient treatment were recorded in the post-discharge figures. The same offence is not entered under both known and not known to the police. Double, etc., entries refer to different disorders of behaviour and not to repetition of the same disorder, which also frequently occurred. Irritability and bad temper were so frequent throughout the series that they are not listed at all. Also not listed are symptoms which in other settings would be called " paranoid." Suspicions, jealousies, resentments going on to ideas of reference even of a delusional quality were found in many cases, quite apart from any true paranoid illness.

Behaviour Disorders not known to the Police.

Resentment at Government, etc.	3	20
Lying	1	3
Attempted suicide	3	8
Alcoholism and/or drug addiction	17	15
Assaulting others	3	7
Smashed furniture at home	1	1
Adultery	2	3
Associated with, or married, undesirable women	1	3
Sexual perversions (involving other people)	5	2
Prostitution	1	2
Venereal diseases	5	1
Separation from spouse	3	3
Gambling	1	1
House breaking	1	0
Theft	3	6
Cheating in examination	0	1
Forged prescription	0	1
Illegitimate pregnancy	0	1
Miscellaneous	6	4

Offences known to the Police with or without charge being made:

Broke into chemist's for morphia	0	1
Drunkenness	0	4
Theft	5	7
Defrauding Ministry of Labour	0	1
Sending obscene or insulting letters by post	0	2
Assault	2	3
Sexual perversions	1	2
Failure to maintain family	1	1
Masquerading in uniform	0	2
Attempted suicide	0	1
Traffic offence	1	0
Simulation of espionage	1	0
Breach of peace	1	0
Double entries	13	16
Triple entries	2	8
Quadruple entries	0	4
Five entries	0	1

By " resentment at the Government " is meant a dissatisfied, disgruntled, aggrieved or resentful attitude about certain standard subjects—the medical treatment given in the Forces, being discharged from the Forces, not having a pension, or attributing the responsibility for the illness to the Forces entirely. If this disorder of behaviour is excluded in the cases in which it was the only disorder, then in the post-service list the disorders were all due to 30 psychopaths, 3 mental defectives, 2 epileptics, 7 psychotics and 6 neurotics. The pre-war offences were committed by very much the same cases.

Reasons for Persistence of the Illness after Discharge.

The 18 cases in which this hospital acted as the military hospital were not considered. The biggest single reason for persistence of the symptoms was that in 79 cases the patient was so affected or predisposed psychiatrically before enlistment that the continuance of the condition was inevitable. One patient recovered very soon after discharge. Some special causes for persistence, related to military service, were considered, multiple entries being made for some of the cases, including those predisposed as above. A fear of re-enlistment was admitted by one patient, and one wondered if this did not sometimes form a motive for persistent symptoms in other cases. In 32 cases the trauma of having been proved inadequate to military life seemed to induce feelings of inferiority, depression, self-reproach and of inadequacy for civilian life and for meeting or competing with others. Related to this

in 8 cases was an apparent motive of face-saving, the patients justifying their discharge to themselves and others by continuance of symptoms; and in 8 cases a masochistic element in persons who had gone through life with a sense of impending disaster; when the disaster occurred, in the breakdown and discharge from the Forces, their conscious or unconscious fears were confirmed and they were unable to readjust. In 21 cases the possession of, or the hope of, a pension seemed to be an adverse influence. In 20 patients, mostly schizophrenics, it was thought that the military age-groups corresponded with the usual age of onset of such conditions.

There were many other, less specialized, reasons for persistence of symptoms such as the natural duration of the illness, the continuance or the development of personal difficulties and excessive hours of work.

Pension.

It is not correct to say that no psychiatric cases are entitled to a pension. Some psychotic and many head injury cases are obviously entitled, and who shall define where these conditions end and psychoneuroses begin? Psychoneurotic cases are also entitled if the circumstances show that the condition was due to military service. In all types of case the decision whether the condition is wholly, partly or not at all attributable to service rests upon a full study of the individual case, including family history, degree of predisposition, non-service causes, length of military service, combatant experiences and wounds, accidents and illnesses on service. 110 of these patients had no claim, and in 3 the records were insufficient for analysis; 11 were receiving pensions varying from 30 to 100 per cent. In 3 cases no pension was awarded at first, but was later granted, sometimes on representations from this hospital. A further 3 cases who we think are entitled have not yet been recognized officially.

Discussion.

This paper demonstrates grave and distressing disorders in the mental health, work records and social behaviour of ex-service patients suffering from psychiatric states. The validity—or rather the general applicability—of the findings depends upon whether this series is a representative sample. It is not truly representative because it includes only those so severely affected as to need further treatment, and because it includes very few patients whose illness was mainly attributable to fighting conditions. Yet it must be fairly representative, as it includes 130 patients and covers four years of the war. Of the 130 patients, 45 suffered from psychopathic states as described by Henderson (1939). It was in this group that most of the disorders of behaviour occurred. They were, in Henderson's words, "individuals who conform to a certain intellectual standard, sometimes high, sometimes approaching the realm of defect, but yet not amounting to it, who throughout their lives, or from a comparatively early age, have exhibited disorders of conduct of an antisocial or asocial nature, usually of a recurrent or episodic type, which, in many instances, have proved difficult to influence by methods of social, penal and medical care and treatment." These socially maladjusted persons formed the biggest single group in the series. This is a bigger proportion than has been reported in military cases in the past except by Logan (1941). He found 32 psychopathic states in 44 service men and 6 servicemen's wives with psychiatric states; this was in Malaya before fighting occurred there. Psychotic and psychoneurotic cases may recover more readily after discharge, leaving a bigger proportion of psychopathic states. However, a number of the psychopaths had presenting symptoms of neurotic and sometimes psychotic types, and some had apparently been classified accordingly in the military hospitals they were in. But the underlying psychopathic tendency was the important factor.

In the whole 130 patients, predisposition was so great that 102 of them should never have been recruited. Few were exposed to truly military stress, such as prolonged service or combatant experience. The causes of the psychiatric states being so largely personal and endogenous, the results of treatment were poor. The figures given for work records, disorders of behaviour and hospital admissions indicate the poor post-service adjustments of the group, but the figures apply partly to the time before the patients received their civilian treatment. The final

results have not been separately listed because no follow-up was undertaken, but they may be a little better.

Military psychiatry has a more positive and constructive side to it than the weeding out of the unsatisfactory persons, such as form a large part of this group. Rees (1943) wrote: "The personnel selection work of the Army is a major contribution to its mental and physical health, as well as to its fighting efficiency, and out of the present General Service procedure it seems probable that there will develop a method for use in industrial selection in the future and for the sorting of any large groups of men and women. . . . It seems as though . . . the War Office Selection Boards for choosing officer candidates . . . have established a valuable principle for the selection of specialists for various professions and occupations."

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RESORT TO PHANTASY IN INDIVIDUALS AND SOCIETIES.

By G. R. PEBERDY, M.D., D.P.M., Major, R.A.M.C.

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THE careful contribution on "Prisoner-of-War Mentality" by Major P. H. Newman (*Brit. Med. J.*, vol. i, p. 8, 1944) has provoked this record of related psychological reactions. The men and women to be described, though not prisoners-of-war, were nevertheless imprisoned by psychological difficulties no less harassing than those material restraints, which, as Newman points out, operate mainly by frustrating or reducing to futility the accustomed interests, satisfactions and tasks of human beings. In the problems of prisoners-of-war a large part is played by retreat into phantasy. It is suggested below that, in human affairs and in clinical work, the scope of this particular reaction to frustration is very much wider than is commonly realized. The range is probably from what is colloquially called "uplift," to mental states not very unlike psychoses (which have in fact been referred to as "pseudo-psychoses"), and, indeed, possibly to the psychoses themselves.

War and its aftermath offer unusually vivid opportunities for the observation of flights into phantasy in use as a technique for minimizing emotional stress and conflict, both in individuals and in groups. This paper comprises four sections. They describe, in order, individual cases of resort to phantasy in unendurable circumstances; group attitudes in frustration; the history of some epidemic psychic afflictions and, finally, general remarks as to the relationships of these occurrences.

SECTION I.

In the case-histories which follow, as a result of situations with which the patients have ceased to cope in any real sense, there can be seen the development of "childishness" and of varying degrees of denial of the real, but unacceptable, world. The records are compressed from the originals written between May, 1941, and December, 1942.

Pte. F. R—, aged 32; service, 14 years. The blurred mental state with memory defects precludes clear history-taking, but documents from the unit detail a series of stresses, including exposure to severe action at Dunkirk, infidelity of his wife, lack of care of the children, the death of a child, and, finally, a charge for desertion following an absence of 96 days. His appearance is slouching and untidy, his expression vacant, and manner childishly foolish. The intense anxiety and mental anguish are but thinly veiled. Attempts to discuss matters excite anxiety and complaint of headache. If not addressed he sits mute, occasionally gazing round, evidently without interest or comprehension. Any object presented for examination is taken slowly, inspected with apparent meticulousness, turned round and much handled. His expression, meanwhile, is of dull, open-mouthed mystification. He gives "approximate answers" when asked to identify objects. (The world of reality is implicitly repudiated.) An ink bottle is called a "vase"; hat—"Same as I have"; pencil—"To write with"; cup—"You drink with it"; spoon—"What a baby uses"; blue pencil—"black"; and so on.

Dvr. J. T. H—, aged 42; war service, 2 months. He has been absent without leave six times and has just been sentenced to a further spell of punishment. Previously seen by a psychiatrist for impotence; his wife and child are ill; the unhappy marital state is growing worse, the wife threatening separation. The poor school record and menial broken work record suggest mental dullness. He served seven years in the Regular Army, including service in India and Palestine. The complaint is of general anxiety symptoms and depression. His attitude is bowed and unmoving. The first impression is of malingering and, indeed, some degree of conscious exaggeration seems present. If not continuously stimulated he progressively declines into torpor. When presented with objects he gives "approximate answers," examples of which could be indefinitely multiplied. A pen is called "pencil"; ink bottle—"glass"; pin—"needle"; watch-face figures—all incorrectly stated by one or two numerals; brown is named "green"; dark blue—"pink"; red—"white."

Pte. L—, aged 38; service, 2 years. Father in mental hospital. Steadily employed in civil life as paper mill hand. No obvious history of nervous disorder until eighteen months ago, when he was exposed to bombing. Since then his condition has deteriorated. He is tensely

tremulous, moves slowly and appears on the verge of tears. Dazed and perplexed, he is very slow in formulating conclusions. "Approximate answers" appear. A drawing-pin is called a "press-stud"; ruler—"measuring tape"; pin—"safety pin," etc.

Pte. J. K—. He has, in the past, reported sick with diffuse signs of anxiety. He is now charged with being absent without leave. He has been previously discharged from the army, probably on the grounds of dullness. His schooling occupied three years; he is illiterate. The attitude borders on lethargy—the expression is lost. There are evidences of auditory and tactile hallucinations. He gives "approximate answers." Pen—"pencil"; ink—"water"; paper—"cardboard"; chair—"form"; table—"slab"; coat—"What you put on." He says that fish live in trees and birds on the ground; that he has never heard of bread and (though near the Thames) that we are in Scotland.

Another case of particular interest follows, though his detailed records cannot be traced. He was a man of about 30, a regular soldier of good repute, a high-grade defective of presentable appearance. Before admission he had been employed on clerical duties much beyond his capacities. He presented the same dull, mystified air, apparently had auditory hallucinations and behaved childishly, having at first to be assisted with toilet and dressing. With silly inanity he would return "approximate answers." Shown horses in a magazine, he said, "Eeh—camels"; or, having a blue ink smudge on a finger indicated to him, he said, "Eeh—it's blood." Such answers were delivered in the typical, drawling, vacuous fashion of these people, not carrying any sense of real interest. His ridiculous irresponsibility was well illustrated when, meeting an important officer in a corridor, he approached close, raised the right hand, and announced in a hoarsely confidential whisper, "I've got a message from Hess." (The Deputy Führer had recently arrived.) This patient recovered from his "pseudo-dementia" in about three weeks. On his returning to duty the C.O. put him back to clerical work, refusing to believe that the man was defective. He was later seen in another hospital by an orderly of mine who reported that this time the man was quite rational. He had wholly simulated the condition on this latter occasion to avoid his work, hoping that he would be sent back to the care of those he had known in the first hospital. The case serves to emphasize the shadowy nature of the borderline between the conscious assumption of the puerile mask, and the morbid state in which the perpetuation of the manner has become habitual and out of conscious control.

In a series of approximately 2,500 service psychiatric out-patients, 17 cases of this hysterical puerilism were observed; not all of these gave "approximate answers," but they were all touched by absurd infantilism. One man arrived with a tooth-brush moustache and hair pulled down over his forehead, claiming to be a caricature of Hitler. Another produced a dirty sausage from a pocket and proceeded to eat it during interview. Another gave an exaggerated mimicry of the "good soldier," posturing the positions of "attention" and "about turn." Vacancy, mental and physical sluggishness and depressive basis were apparent in all. Family histories were, in the main, unobtainable. At least nine of the patients had exhibited psychiatric symptoms in earlier days, such as anxiety states, fits of irritability, truancy, delinquency, excessive religiosity, asocial stubbornness or predilection to childishness in face of difficulty. Four had no account of any such past history. Intelligence tests are here unreliable but, within broad limits, it can be said that eight were definitely below the average population level, five definitely above it. In five of the less intelligent the stress of military adaptation had been apparent. Six had been absent without leave, some repeatedly. Six had ascertainable stories of severe cumulative stresses. Following a head injury incurred in a motor cycle accident, one man displayed this syndrome, which a brain injuries clinic could not relate to the head injury as such. It seemed likely that he feared an action for the unauthorized use of the army machine. He was below the average intelligence of the population. In several cases, earlier phases of the syndrome had suggested malingering; indeed, differentiation for medico-legal purposes may not be easy. The suggestion of simulation arises from the absurdity of the symptoms and also because the reaction usually emerges comparatively gradually, possibly taking many weeks to rise to its maximum. In the germinal stage the person can, at will, slip into phantasy or return to reality. One man was known to have begun by telling his comrades each morning of the type his idiocy would assume on that day. His M.O. eventually reported him as "unmanageably violent." Other hysterical manifestations were frequently associated, either at the time of the examination or

in the history. A few showed gasping breathing, stutter, or other conversion symptoms at the time of interview. However, none with strongly developed puerile behaviour nor those giving "approximate answers", evinced any other marked conversion phenomena at the same time.

In suitably predisposed personalities, retreat into phantasy may take place quite apart from external abnormal stress, partly through desire to be noticed and for sympathy, partly as a relief from the distastefulness of facing true facts, or from an incapacity to do so. (None of the cases hereafter described are included in the seventeen above mentioned examples of hysterical puerilism.) The people called pathological liars are here relevant.

Pte. J. W. T—, aged 38; service, 1½ years. Reported from his unit as being of irrational and emotional conduct and conversation, this man had a very poor school record and recalls that, as a child he had "mad moods" in which his mother could not control him. He indulged in breaking and entering, saying that he thought of these escapades as "just an adventure." After some years in a Borstal Institution he never held a steady job and spent much time as a tramp. He has been in prison for periods of up to nine months. In a naïve, condescending manner, he describes at length incredible tales of his own valour. He says he served in Norway and Iceland, but this is unconfirmed by his records. He remarks that other soldiers refer to him as the "Hero of Norway." In an off-hand way he talks of heroism in the London blitzes. There is a history of psychosomatic gastric disorder, "whistles and bangs" in the head, and a disability sounding extremely like a hysterical monoplegia. He is aware that certain of his tales are fabrications, and knows that all his life he has been prone to this sort of imaginative thinking. Certain beliefs which cannot be based on fact have attained practically delusional fixity. His grasp of events is moderately good, and intelligence above population average.

Predisposition to phantasy thinking may be a familial trait. A very highly intelligent, vividly imaginative woman suffers from migrainous and epileptoid attacks. She has an unusually high facility for imaginative embellishment of incidents, and describes them in their novel forms as if they had actually so occurred. At times, with others, she is aware of forcing a hilarity which is succeeded by a fleeting sense of unreality and fit of depression. An actress herself, she compares this with the collapse of actors after a great dramatic effort. It seems comparable with the sense of depression experienced by some persons consequent upon the renewed impact with reality after resort to the glittering world of the cinema. In years gone by this woman's sister caused considerable tribulation to her well-to-do family by persistently expressing the idea that she was indigent and starving. She went to the length of accepting charity feeding, and eventually was said to have "fooled herself." A brother used to imagine that he possessed a country house, of which he would converse in exhaustive, realistic detail. He has now become a devotee of an unorthodox religious cult. An aunt was a source of gentle amusement in that she gave "approximate answers," as, for example, "I was going out of the window" (meaning "door"). This peculiarity occurred so often and in such diverse ways as to render it improbable that her mistakes were the more ordinary slips of language.

It is seen that in individuals, retirements into the mythical world take manifold forms. Not only do they shade off into classical hysterical fugues, but they may bear schizophrenic-like touches. It is not infrequent to meet with a soldier who has a history of what has been called a schizophrenic interlude, but who has completely recovered and whose general story does not obviously suggest schizophrenia. The more acute reactions of the seventeen cases noted would appear to be of good prognosis, though further hysterical or anxiety manifestations may be anticipated.

Section II.

As a protective veneer for a state of anxiety, frustration and depression, there may take place reactions which are in some degree infective within a group. Though it seems probable that the conditions about to be described grade almost imperceptibly into the morbid phenomena previously detailed, they are, nevertheless, of less serious import and approximate to everyday attitudes. Whilst their origin is apparently from single persons, we may yet observe an almost explosive spread in a community highly predisposed by the widespread distribution of similar emotional problems, especially as it is possible for individuals to "carry" the notions elsewhere, where, if the soil is ripe, these will "catch on."

First, an individual reaction which, though it did not spread, is the type of

thing which forms a starting-point for epidemics. An M.O. in the desert warfare took to keeping in his quarters "ducks," which he addressed, fondled and fed; and yet these ducks had no existence in fact. They were absolutely products of his imagination. Though the M.O. was otherwise as usual, the story being spread of "Doc.'s ducks," his mess-mates naturally began to look askance. Challenged on the subject, the M.O. merely innocently replied, "Why shouldn't I keep ducks? I've always liked ducks." In the end he was sent back to base, and on leaving advised others to take to keeping ducks if they got tired of things. Had the doctor chosen objects a little less bizarre than ducks in the desert, his advice might have been followed.

Soldiers in long isolated desert spots have taken to dogs, though none of their canine friends were of flesh and blood. One has been told of a unit which indented to base for a fresh lead for the unit "dog," the old one being worn away from much trailing on the ground. This dog *motif* is a comparatively common one; it seems a love object associated with ideas of domesticity. A hospital A.T.S. kitchen staff, their morale undermined by prolonged tedious work, evolved a dog from their minds, and upon this apocryphal creature lavished caresses, its own mat, and daily food. In the early "phoney war" days in an N.F.S. station, the men grew fed up with much brass cleaning. A cockney humorist produced fictitious animals, starting with a dog, and including even a camel. He left the Service in December, 1939, and returned to his civil work as a factory mechanic. At this later time he was asked about his dog, whereupon he laughed and said he had not seen it since he left the station, and presumably it had remained there. In this N.F.S. station the symptom spread from the person above mentioned. Other members of the staff invented animals, and also postulated floor-cloths on the dining table, beetles in the soup, soap cakes on the floor, and so on. We see also how the influence may be latent and spring up again even from others than the original instigator. The N.F.S. officer, my informant, recalled that, having in the past participated in the fun about the dog in the station, he resurrected such an "animal" over two years later when he was living in a mess temporarily clouded by the tedium of enforced inactivity. Another example of the puerilism being taken out of its original setting was seen in a Home Guard member who surprised his family circle and visitors by pretending to pull out a hair from his head, moisten and straighten it with supreme care, stand it upright on extended forefinger, and insist that this ghostly object be passed round the group from finger to finger. He explained that this was a favourite pastime in the Home Guard hut.

Three more developed group reactions follow, one army, two civil defence. A certain highly trained army unit reached a low ebb of morale consequent upon boredom and chagrin at repeated disappointments regarding overseas service. The men, including decorous N.C.Os., indulged in ridiculous behaviour. Stepping with nicety over absent wire, they adjured one to be equally cautious. Pedalling phantasmal bicycles and congregating to cut down intangible corpses, they were childishly foolish in order to hide their sullen irritation, and forced an unwilling gaiety to cloak their languishing spirits.

During a particularly tedious spell in an N.F.S. station the men banded into a company of "Gones" (the similarity in pronunciation to "Gnomes" is worthy of note), appointed their most obese fireman to be "Queen of the Gones," and on many evenings galloped and shrieked round the building. On retiring, regularly one would sit up, flash a torchlight into the face of his opposite number and say, "How are you, Gone?" to which the other would reply, "Very well, and how are you, Gone?" The underlying unrest would often be evidenced in a muttering of imprecations from some over-irritated fireman. It is interesting to observe that my informant took no part in these antics. He was a homosexual, schizoid psychopath, and became at such times absorbed in reveries of acting with great success on the stage.

A civil defence ambulance depot was supposed to be a ship by an intelligent, anxious, depressive man who developed this idea with an old sailor. In varied degrees the rest of the staff participated. It was reported of the intelligent man mentioned that he had been known to cry "like a child" after slight criticism in the course of his civil defence work. These people swayed round the building saying such things as "Rough night to-night," "Have we cast anchor yet?" and so on.

The ritualistic character of these manifestations is noticeable. This was a marked point with " sand crazy " men in the desert. A man in this state might be seen suddenly to rise, take up an imaginary rifle, perform operations of drill, spit deliberately at the end of each line of paces, and at the expiration of the performance, sit down again with a puff and flourish of the hand to flick off the forehead sweat. This might be repeated day after day. The ridiculous nature of many morbid obsessional rituals is here worth recall, together with the acceptable explanation that they serve to protect against the intrusion of intolerable guilt into the conscious. The kernel of these conditions in the Army and services is known as being " browned off "—a compound of despair at the futility of effort and anger at the thwarting of action. Intrusions into the " private worlds " of schizoid psychopaths are often met with hostility, and in almost all of the case pictures painted here one can see how anger lowers in the background. This matter of pent-up aggression is further alluded to in Section IV.

Section III.

Having observed the ontogeny of these conditions, we shall now investigate their phylogeny as demonstrated in history. Most of this information is derived from Hecker's *Epidemics of the Middle Ages* (Sydenham Society, 1844). In 1374 assemblages of men and women appeared in Aix-la-Chapelle and exhibited in public this spectacle. They formed circles hand in hand and, as if losing control of their senses, danced wildly for hours together until they fell in a state of collapse. Their fancies conjured visions and they claimed to see religious figures. The disease spread rapidly all over the Netherlands. The priests felt menaced, since the possessed multitudes assembled and poured vilifications upon them. Exorcism was temporarily effective, and " St. John's Dance " died away for a few months, but soon after reappeared in Germany, eventuating in social disturbances of some magnitude. Various disciplinary measures caused it to subside here in four months, but recrudescences took place in various parts of Europe through the 14th and 15th centuries, and, in a less degree, in the 16th and even 17th.

In 1418 Strasbourg was visited by this epidemic, and at this time priestly attention was sought in the chapels of St. Vitus. Previously, the name " St. John's Dance " had been attached because St. John's Day, back to the 4th century, had been solemnized with rites including leaping through flames and Bacchanalian dancing. It seems likely that the revels of St. John's Day, 1374, precipitated the dancing plague in a setting of widespread preceding distress resulting from great floods in Germany, the feuds of the Barons and consequent oppression of the populace and the general despair on the aftermath of the Black Death. Desperation sought relief in the intoxication of artificial delirium. Paracelsus endeavoured to bring in a more rational light, saying of the manifestations, " We will not ascribe them rather to God than to Nature." His magical therapy deserves recall. The patient was to make an image in wax and, by an effort of thought, to concentrate all his blasphemies and sins into it and then to burn the effigy. Immersion of the patients in cold water was also recommended. The magistrates hired musicians to carry the dancers more quickly through their dance, and directed athletic men to skip alongside to hasten their exhaustion. The epidemic tended annually to recur. Prior to the festival of St. John patients felt a disquietude and dejected restlessness, but after their dancing fits were relieved over the rest of the year. St. Vitus' Dance was on the decline at the commencement of the 17th century, when wars swept the west of Europe and the plague died out. The dancers, having been recommended to general commiseration by their patron saint, St. Vitus, were sheltered from public resentment. Other fanatics were less fortunately treated. Such, for example, were individuals believing themselves to be metamorphosed into wolves, the so-called Lycanthropes. Lycanthropy existed in Greece in the pre-Christian era and in time spread all over Europe.

Gariopontus, a Salernian physician of the 11th century, first described a form of mental aberration showing a remote affinity to the Tarantula disease now to be considered. According to him these patients had sudden attacks of wild movements, and if when in this state they chanced to hear music they began dancing until exhausted. Such people existed in considerable numbers. Tarantism itself appeared in the 14th century in Italy. The influence of religion at this time, with its pomp, flamboyant practices and mysticism, contributed to the superstitious frame of mind which prepared the way for these disorders. In much later days

similar afflictions have been propagated in limited districts ridden by superstition. There were other predisposing causes of magnitude. The Bubonic Plague had ravaged Italy sixteen times between 1119 and 1340, spreading endless devastation. The resulting morbid sensitivity of the minds of men culminated in the fear of the bite of the Tarantula spider becoming of such degree as to give rise to the Dancing Mania, which spread by suggestion. There was a conviction that the poison of the Tarantula was expelled from the skin by dancing, but if any trace remained the dancing fits might linger. Many had it recurring year after year, always preceded by a fit of depression. The afflicted lay inert, to spring up at the first notes of the Tarantella melodies and dance for hours on end. Musicians were hired in a sufficiency of relays to carry on to the point of the patient's exhaustion. Bands of musicians travelled Italy every summer solely to play for the tarantism. The skirl and breathless excitation of some forms of this music is well conveyed in the poem "Tarantella" by Hilaire Belloc. Tarantism reached its height in Italy in the 17th century. Such was the dominion of persuasion of the inevitable consequences attending the tarantula bite that even a distinguished prelate, the Bishop of Foligno, having allowed himself to be bitten as a joke, obtained cure only by the music of the Tarantella. Needless to say, without the correct psychological background, the bite has no such effect as dancing fits. Tarantism practically died out early in the 18th century.

Wherever circumstances have paved the way in society, afflictions similar to the dancing plague have appeared. In the early 19th century, oppression, insecurity and a rude religion existed in Abyssinia, the superstitious beliefs being comparable with medieval Europe. There was recorded in the Tigré country of this land a condition called "the Tigretier," exactly analogous to tarantism, bearing the same relation to musical influence and associated with episodes of depression and stupor. Alongside it there existed sects such as Christian Flagellants and cults like Lycanthropy, the animal form chosen being usually the hyena.

Through the centuries numerous examples of similar epidemics have occurred in confined communities. In the early 18th century a nun in a French convent began to mew like a cat. Shortly afterwards other nuns also mewed. At length all the nuns mewed every day at a certain time for hours together. The whole neighbourhood heard this daily cat concert, which ceased only when a company of soldiers with rods was stationed by the convent and the nuns warned that they would be whipped until the mewing stopped, whereupon it did. A convent epidemic of the 15th century took the form of biting. A nun began biting her companions; the other nuns appropriated the action, and the biting mania passed from convent to convent over a great part of Germany, and was recorded in Holland and Italy. In 1727 a zealous deacon died in Paris, and in 1731 a rumour spread that miracles took place at his tomb, people being seized with violent convulsions. This infection spread far beyond Paris and the sect of "Convulsionnaires" arose. They spun round at incredible speeds and fantastically contorted their bodies. They played with children's toys and drew little carts. A famous advocate, a member of the sect, barked like a dog for some hours each day, and even this was imitated. This manifestation lasted until 1790, being scotched by the Revolution, but it lingered on well into the 19th century in isolated cells. In 1760, in Cornwall, a sect of Methodists called "Jumpers" arose. They worked up into religious frenzies and then jumped with extravagant gestures until finally exhausted. Whole meetings participated in the mad orgies. At a later date in the U.S.A. some Methodists indulged in barking like the Convulsionnaires. The companies ran on all fours and growled. In 1803 in Tennessee what was called the "Chorea" appeared as an epidemic. It followed on some years of violent resurgence of religious fervour in the Western States. At some meetings the excitement grew so intense that worshippers were afflicted with sudden violent muscular contractions, causing gesticulations of the trunk and neck. The disorder spread into several States. It was noted to be associated with recurring "melancholia." Many other such occurrences have been recorded, notably in Cornwall and the Shetlands. Some persisted into the later 19th century.

Section IV.

Have these epidemic excesses now passed for ever? It seems that their seeds lie universally latent, ready to grow on the soil of national disillusionment, the

fruits being modified by the beliefs, culture and degree of critical sophistication of the society in which they arise. It has been seen how the flight into phantasy occurs in a person overwhelmed by circumstances so unendurable for him that he gives up the unequal struggle. The maintenance of the unreal existence requires for its continuance a degree of isolation, of divorcement from the world of reality. In the individual this may, as we have seen, adequately be achieved by the hysterical mode of dissociation. In groups the need is not dissimilar. The group exercising the abnormal practice must be, to some extent, self-contained. This factor may be given by geographic isolation or gained by group cohesion associated with the fostered persuasion that they are " different." It becomes almost a code of honour that none shall introduce the baleful glare of cold actuality. The adoption of ways of life ordinarily not to be tolerated by society at large probably gives each devotee an initial sense of shame, diminished in relation to the degree in which the novel mode is adopted by confederates. In time a spirit of competition emerges. The members vie with each other in embroidering the excesses, though these can never lose their essential ritualistic character, admitted by all, for if this, a binding factor, were to go, the group would begin to disintegrate. Moreover, jealousy cannot be permitted too free an expression, since there is to be reckoned with not only the antipathy of each of the cult towards the world at large, but also that of each to the other. The underlying hostility has been evidenced in several of the reactions described. In this field of mutual irritation, contact with fellows is not always reasonably possible except through the friable bonds of the chimerical life. Intercourse with the world of noisome realism, where people grapple with grim actualities, evoking as it does depression and disillusionment, is avoided as far as possible, if need be in a hysterical comatose state.

The reaction may serve both to give " uplift " in low morale states and as a relief when there is abnormal tension in high morale situations. In both it offsets the onset of depression, and negatives the oppressive futility sense which continuously breaks in. As an example of the latter high morale condition, the less pernicious state, may be instanced the production of the " Gremlins " by the R.A.F. It is noteworthy that the lore of these curious creatures was in the past guarded by the group, and a certain shade of resentment has existed at such appropriation as has occurred in the community at large. In the low morale state of the early inter-war years we were presented with the spectacle of the " Bright Young Things," their tinsel existence and garbled clannish jargon. The twenties and succeeding years had many typifications of these varieties of ebullition such as the " Froth-Blowers' Club " and the " Yo-Yo " craze.

How near the surface are these things has been seen in the instances cited from Civil Defence and the Armed Forces. Not only do these conditions result in dissipation of the group vigour, not only are they symptoms of purposelessness and frustration, but they may also, both in individuals and in groups, result in a flouting of conventions and of authorities. The facility with which a person resorts to phantasy as an escape is in inverse proportion to the strength of the character and the position is no different with nations. It has been seen that the group will far more easily behave childishly than will its members if separated. In powerful States the reaction may become an international danger. The birth of the Nazi party bears more than a superficial resemblance to the genesis of the " Bright Young Things," though, of course, infinitely more vicious, more subtle, and growing upon an even more fertile soil of national temper. Beliefs have been modified and knowledge advanced; the mists of necromancy clear, but the mechanisms of the mind have not altered in past centuries. The ravings of the Convulsionnaires may not now be heard, but the Hot Gospellers' stridency is not so long died away. The ghastly Lycanthrope may not be with us now, but it seems possible that an incomparably greater horror is spread by stimuli not unlike those which drove him to howl beneath the moon in the medieval cemeteries.

In the years following the present conflict the recurrence of such phenomena as these, attendant upon social disillusionment, is not unlikely, and their extent will be a criterion of the spiritual satisfaction offered by the new regulation of society, when energies are no longer absorbed by the rages of war, and when the pack is less bound in the striving for an immediate objective.

FOREIGN SERVICE NEUROSIS.

By J. F. Burdon, M.B., B.S.,
Temporary Surgeon-Lieutenant, R.N.V.R.

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" No man will be a sailor who has the contrivance enough to get himself into a jail, for being in a ship is being in a jail, with the chance of being drowned."—*Dr Johnson* (1759).

Since Dr. Johnson uttered his opinion a great improvement has occurred in the living conditions of sailors; and, for that matter, jails have improved too, but it is doubtful whether the average potential sailor of to-day would take Dr. Johnson seriously. Times have changed.

On the other hand, some features of sea-going are unchangeable; absence from home and loved ones, irregularities of food supplies and mail, discipline, lack of privacy and the rest, all tend to produce an unnatural environment. This has its effects on the personality, and the present paper, based on personal experiences, attempts to give some idea of the quality of these reactions. It is a series of observations, extending over a period of two-and-a-half years, culled partly from memory and partly from journals and letters written at the time. Much variation in the type of reaction is recorded, even though the conditions of service were similar for all, which is clearly due to constitutional and personal differences in the individuals concerned. The general conditions tending to produce neurotic reactions are described first.

General Factors in Causation.

The cases studied were part of the complement of one of H.M. sloops operating in the tropics, largely on detached service, from August, 1940, to January, 1943. The complement numbered about 100 at first and gradually increased to 150; as

1940	August September October November December	Monotonous patrols in Persian Gulf.
1941	January February	Five weeks' refit. Ship's company lived ashore in Bombay.
	March	Patrols in Persian Gulf.
	April	Escorted convoys to occupy Iraq. No fighting seen.
	May June July August	Remained up Shatt-al-Arab, usually at anchor. Climate severe. Malaria.
	August 26	In action for occupation of Iran. Minor casualties only.
	September October November	Patrols in Persian Gulf and Red Sea escort work. Threat of air attack, but no action.
	December	
1942	January February March April May June July	Antisubmarine escort and patrols in Indian Ocean. (Two days' leave to both watches up-country in Ceylon in May.)
	August September October	Refitting 3 months. Ship's company lived ashore in Bombay.
	November December	Anti-submarine escort and patrols.

a consequence the mess decks became progressively more crowded and the ventilation less adequate. The foregoing table summarizes the main incidents of the period.

It can be seen from the table that the greater part of the time was spent at sea. The longer periods were relieved to some extent by boiler-cleaning, which lasted for a few days and came about once in six weeks. The short spell in harbour thus obtained was, of course, of little use to the engine-room staff and key men, whose duties in harbour were in some cases more onerous than at sea. Certain factors emphasized the isolation of detached service; mails arrived at long intervals, sometimes not for several weeks at a time; there was no wireless for entertainment at first; and, though the best available was provided, the facilities for recreation were poor, particularly for ratings in the Gulf.

In addition to monotony and strain, the fierce climate played a major part in producing neuroses. The summers of 1940 and 1941 were very humid and hot, with malaria in addition in 1941. In June, 1941, for example, the forenoon temperature in the Sick Bay was about 110° F., although the deck above was wooden and kept wet. Sometimes it was midnight before the thermometer registered less than 100° F. The evening fall of temperature was offset by the relative increase in humidity, so that the only respite from sweating profusely came between midnight and morning. Even so, it was usual to wake up on a mattress sodden with sweat. Kata thermometer readings (measuring cooling power of the air) were taken at the worst times, in the full blast of a fan, with the bulb wet, and were 11 to 12 at 10.45 hours and 6 to 7 from 16.00 to 24.00 hours; this indicates that the cooling power of the air was grossly below efficiency or comfort levels. The wet bulb in the shade on deck showed maximum recordings of just over 100° F. on three occasions. It is usually regarded as impossible to work under these conditions, but work went on for weeks on end until the cooler weather arrived. The usual "rig" was a pair of shorts and sandals, and these were permanently wet where they touched the body. Sweat dripped from the elbows, fingers, nose and chin and ran in a rivulet down the spine. It was a difficult task to write a letter without smudging it. A copious fluid intake was, of course, a necessity, and everyone suffered from sweat rashes, often with sepsis. A journal referring to this period mentions the "repeated and powerful mental irritation induced by humidity, heat and flies." Such conditions engendered in most subjects an irritable despair which cannot be adequately described.

In 1942 the summer was spent in the Indian Ocean, where the temperatures were much lower, but the S.W. monsoon caused discomfort, especially to those who were not good sailors. The winters in all cases were pleasant and cool.

Apart from the climate, an important environmental condition was the quality of the diet. Every effort was made to keep its standard high, but it naturally varied according to the facilities available and, in general, it was good when the ship was in harbour and for a few days thereafter, but monotonous and unappetizing at sea. Occasionally the staple vegetable for some days was rice, with corned beef, dried peas and biscuit in addition—nutritious, but exceedingly grumble-producing. Potatoes easily went mouldy, bread was of poor quality when made on board, and meat was inferior and often tainted. Appetites varied with the quality of the diet, and were not improved by the presence of numerous flies, cockroaches and weevils. In 1942 rats were troublesome. Finally, the food was often made unpalatable by uninspired cooking. Nearly everybody lost weight, some as much as a stone.

Physical illness was common, and during the worst period as many as 10 per cent. of the complement were off duty sick at one time. In the worst quarter 43 per cent. of the total complement had an illness lasting, on an average, 7 to 14 days. The main causes were malaria, septic infections and heat exhaustion; all were related to the climate. Accident proneness was also raised during the hot weather.

Another factor operating on individual morale was the general mood or atmosphere of the ship in the emotional sense. This was less satisfactory at first because of maladjustments between individuals, particularly certain key men, but a gradual change for the better occurred as the complement was freshened by reliefs, and by the end of 1942 she could fairly be called a happy ship. Mood was worst when the climate was worst, but some ships under similar conditions remained happy throughout; so that general mood is more than a secondary effect of climate, and depends on the personal qualities of those responsible for discipline, whether officers or senior ratings.

Illustrative Cases.

Case 1.—Looking back on my experiences as medical officer of the sloop I realize that the conditions already described produced marked temporary changes in my own personality. These changes represent the commonest type of reaction and are therefore described in some detail.

Important events previous to my foreign service, briefly, were: Born, 1915; qualified in medicine in 1938; volunteered for R.N.V.R. in early 1940 and joined in March of that year; appointed to foreign service on May 11, married on May 18, and sailed on June 29, arriving in the Persian Gulf by August, 1940.

On the way out to the Persian Gulf certain special influences began to operate. I was a poor sailor and, though this improved considerably in the course of time, I never felt comfortable in bad weather. I found rolling quite tolerable, though frightening when severe, but reacted strongly to pitching, developing a slight constant headache, anorexia and a feeling of depression. That I could make myself worse by introspection was easy to discover, but I never contrived to cure myself by ignoring the cause. This weakness induced a marked distaste for leaving harbour; fortunately I was never unable to carry out my duties.

On arrival in the Gulf I promptly developed an attack of prickly heat complicated by sepsis. This continued to give trouble until the cool weather arrived in late September. Meanwhile another special factor began to operate, namely, undiluted responsibility. I was only conscious of this acutely on a few occasions when I badly wanted to have a second opinion on a case and could not get one; at other times I did not worry about my isolation except to miss the interest and instruction obtainable from professional discussions.

Yet another special factor was news from home. My wife was living in Plymouth during its blitz, and other relatives needed financial aid on two occasions; information of this sort usually reached me about two months after the event.

After three weeks in the Gulf I began to take alcohol regularly, having previously been a teetotaller. At this time I used it for its sedative effect and to take the edge off the discomfort due to heat; later I also drank for social reasons, sometimes more than enough, but I never noticed any tendency to addiction, and since returning home have felt no special urge to drink.

As the conditions I have already described began to take effect I suffered a steady loss in initiative and enthusiasm. My output of energy remained fairly high, but I progressively devoted my time to things which required less concentration. At first I studied professional subjects, tropical medicine and public health, and took on the duties of mess secretary, wine caterer, censor officer, etc. Later I turned my attention to general subjects which held special interests—economics, history, statistics and shorthand. As time went on my enthusiasm waned still further, and I carried out my extra duties (censoring, etc.) with a resentful feeling that they were none of my business; my studies became very scrappy and an attempt to "rub up my French" was abortive: I found it quite difficult to concentrate. After the three months' refit in the autumn of 1942, however, I regained some lost ground and was encouraged by the belief that my relief would soon arrive. I then took up English with the object of improving my style and, by way of exercise, produced a quantity of verse and prose, mostly of wishful type. At this stage I was relieved. Other forms of activity when opportunity offered were swimming, fishing, and joining in social activities of the mess.

Apart from the steady deterioration in drive just described I became progressively more irritable and less patient. This showed itself in a host of ways. My resentment was easily aroused and I occasionally quarrelled with other members of the mess; I objected to discipline and regulations if they seemed to be unnecessary; I found that colic (associated with occasional bilious attacks) seemed to be less bearable than formerly; I became extremely exasperated if a fly buzzed round in my cabin. At the same time a feeling of apprehension developed, focused particularly on the noise of our own gunfire in practice shoots, shutting myself below decks, possible loss of mail, etc. The real causes were felt at times, but were usually suppressed as "unnecessary worry." At the action in Iran I felt acutely anxious, with mild somatic manifestations, but these cleared as soon as I had something to do and the fear was then forgotten. When I eventually left the ship for home I was very anxious about customs formalities, about being diverted to another job on the way, about losing my luggage, and about a possible change in personality affecting my happy relationship with my wife. I remember no somatic disturbance such as tachycardia or tremor at this time.

On arrival home my worries, being groundless, were all resolved and the symptoms settled down until, at the end of six months, most of them had disappeared. Important curative factors were a shore job and a fairly clear idea of the future—three weeks' leave had a negligible effect.

During the above "illness" the anxiety was quite controllable; it existed mainly as a basic emotional state. Depression was also present in a variable degree, causing undue pessimism and discouragement; one example of this was a fear that the war might be won before I got home again and I would thus miss the armistice celebrations, and possibly be left out East longer than would otherwise be the case. Paranoid features were noticeable, and I was often a little suspicious of things going on behind my back among my messmates, which I sensed were in a vague way to my disadvantage. Mails were so irregular that I unreasonably but firmly believed that the authorities did not take any real interest in our welfare. I felt sure that my relief

was being overlooked at the time when he was on his way to join the ship. Sometimes I thought that we were deliberately kept from our meals by hospitable drinking parties with visitors.

In addition I felt an increased need for sleep, a need for friends (though I had several good ones), and a sense of futility about the future. I lost about 12 lb. in weight; my appetite was variable, but good on the whole. I noticed a distinct lightening in spirit when my relief formally took charge, and also at each successive milestone on the way home.

The last symptoms to subside were the loss of concentration as compared with my former remembered standard, the tendency to object without reflection when asked to do anything, and the paranoid feelings. Some irritability still remains (? my normal degree), but for practical purposes the condition has entirely resolved without ever resulting in more than a slight reduction in efficiency.

Case 2.—This officer, a man in the middle thirties, developed a mild, chronic depression of the reactive type. The factor of separation from his family was predominant, though climate and type of service were still important in causation. His leading symptoms were a tendency to be pessimistic, feelings of inadequacy, over-conscientiousness, difficulty in concentrating on his work, and paranoid ideas about the service authorities, particularly in his own branch. He displayed no anxiety and his insight was good. He was cheery after a moderate dose of alcohol, but never showed any tendency to addiction in four years' foreign service. Though not very happy, he remained quite efficient and effective throughout. He represents a common type of reaction.

Case 3.—This was a rating of about 25, who worked long hours in confined spaces when the Persian Gulf climate was at its worst. After some weeks he went sick with heat exhaustion, running a mild evening pyrexia and feeling fatigued and dizzy. With four days' rest he was fit again for duty, but was advised to take it easy and was kept under observation as far as possible. In spite of this, however, he continued to do extra time, for there was much urgent work to be done and the engine-room staff were reduced by sickness. His Divisional Officer sent him away from his work on more than one occasion. After a further five days of desperate endeavour he had a "fit" in his mess immediately after a bout of duty. When seen a few moments later he was cyanosed, with choking-gasping respiration and complaining of blindness. These symptoms quickly passed off, but he was left quite incapable of work, weeping and trembling at the least disturbance. There seemed to be no prospect of getting him well quickly, and he was transferred to hospital. He returned a week later, fit for light duties, and aware of the need to regulate his activity to reasonable limits. He had no further trouble, though he continued to work a little harder than the average rating. His reaction seems to have been an acute affective disturbance due to overstrain.

Case 4.—This rating, aged 29, developed a marked resentment to the Navy in general. He was above average in intelligence and was promoted to P.O.; later his attitude changed and he felt that the authorities had promoted him in order to get more highly skilled work out of him. He countered by requesting his own disrating on the grounds that the P.O's. work was too difficult for him, and his request was granted because it was felt that a willing leading hand was of more use than a resentful P.O. At this time it was not possible to tell whether he was "playing up" in the hopes of being sent home or whether he was developing real delusions of persecution. He certainly showed intense resentment to the service.

Towards his wife he had a dual attitude, speaking of her as the reason for his desire to return home and professing great affection for her, but at the same time writing letters to her only about once a month and saying unkind things in them. In particular, he accused her of losing interest in him, of writing infrequently and of being friendly to a rival; the last idea he merely insinuated. As well as this he wrote things he knew would be stopped in censorship, and desisted only after the matter had been before the Captain twice. This seemed to give him a certain satisfaction; that he was, in fact, being persecuted. He finally reacted by not writing any letters at all.

For a long time he refused vaccination and inoculation, apparently more to assert himself than for any ethical reason, and because of this he got very little shore leave (regulations do not allow the non-vaccinated to go ashore where smallpox is endemic). On one occasion he broke out of the ship and received nominal punishment only. After 18 months he decided to accept my advice, regularly tendered, and he was inoculated and vaccinated before he had time to change his mind.

On several occasions I interviewed him and was able to confirm his high intelligence; he was introverted and rather schizoid, and very little concerned about the ideas of others, even of those dear to him. After each persuasion he temporarily improved, but on the whole he got worse. At the end of two years he was relieved and he left for the U.K., since when I have no further news of him. It is possible that he would have developed a serious paranoid state had he been kept much longer in the ship.

Case 5.—This man, a P.O. of about 30, was a survivor from another ship, and complained that when he went below decks the space he was in seemed to be contracting on to him; this caused a feeling of panic and he usually had to come up on deck again. He showed mild anxiety symptoms and, after being reassured about these, he was persuaded to fight against the tendency to panic by setting himself some task to perform, such as smoking a cigarette before giving in to the feeling. About a week later he again reported, complaining of headaches. He was again reassured and no further treatment proved to be necessary. He made an excellent adjustment,

carrying out a responsible task in an efficient and cheerful way. He was still symptom-free when I left the ship some months later.

CASE 6.—In this case, post-traumatic headaches associated with no demonstrable pathology grew steadily less severe under the influence of suggestion and persuasion. At the end of a month of steady improvement I referred him for a " specialist " opinion, expecting that the extra reassurance he would receive would reinforce my own efforts. Unfortunately a different view was taken at the hospital and the man was told he was unfit for sea service. Next morning he was worse than at any previous time and I had no option but to discharge him for disposal to shore.

It was interesting, if exasperating, to see how his symptoms depended on the way he was handled.

INDIVIDUAL SYMPTOMS.

The above cases have been chosen to illustrate the various reactions seen, and do not represent the total psychiatric material involved. Almost all the personnel showed some chronic symptoms slightly, particularly anxiety, depression, paranoid beliefs or a mixture of these. There was little hysteria, perhaps because there was little sympathy to be had.

Paranoid beliefs.—Quite the commonest phenomenon was the tendency to develop paranoid beliefs. This was also noticed in the 1914–18 war, and Beaton (1918) pointed out that paranoia was never diagnosed until well advanced, presumably because paranoid ideas were so commonplace. In the present series, apart from Case 4, which might have been an early psychosis, the ideas under this heading were moderate in tone and unlikely to lead to serious trouble. Examples of these ideas are given in Cases 1 and 4; the delusion based on mail delays was particularly widely held. The naval authorities admitted that mails were slow and offered explanations about shipping shortages, but the majority of the complement remained unconvinced by this reasonable argument and felt that no serious efforts were being made to speed the mails—that official statements were mere placebos.

Another strong belief, held by all who were about to go home, was that they were likely to be diverted from the journey to some local pool by an enterprising flag officer who wished to increase his reserves. This idea reached absurd heights when a story was circulated, believed by many, that four gunnery officers had been held in one particular camp for some months and that Admiralty had taken action to check the trouble. The basic idea was probably the fact that the ship's company had twice been told they were homeward bound, only to find that the exigencies of the service caused postponement until, finally, hope was abandoned.

Still another paranoid idea was that foreign service leave was reduced as soon as it was realized that people were coming back from the East in small groups and therefore no effective objection could be made by them. The obvious " shortage of man-power " reason was ignored. This, like the other ideas mentioned, was directed at service organization mainly because of inadequate knowledge of the reasons for things being done. If such difficulties could be adequately met by propaganda these paranoid ideas could hardly arise, for contact with reality would abort them. It is possible that the paranoid tendencies would then take other forms, though this would not happen if it is true that they arise from misunderstandings based on mental isolation from reality.

Similar neurotic reactions are recorded in Polar expeditions, attempts to climb Everest and other occasions when strain and isolation interact. It seems to be a dangerous mixture. Newman (1944) reports paranoid ideas in prisoners of war who feel that they are forgotten men and tend to indulge too much in introspection. Introspection was also regarded as a major factor on a ship in the 1914–18 war (Beaton, 1918). In civil prisons, too, ideas of persecution readily arise, but in this case the reaction is occurring in a selected type of person, the delinquent, who is not likely to suffer from mental conflicts concerning duty, and whose troubles are obviously more constitutional than psychogenic in nature.

As regards normal men on foreign service, letters from home, newspapers and the B.B.C. fill most gaps, but the average sailor is left in great ignorance of the intentions of the service towards him and of its methods and organizations. While it is realized that it is not always possible or permissible to foretell the future, it is thought that more explaining of intentions would do good, so far as this can be done.

Anxiety.—Next to paranoid ideas this was the commonest psychiatric symptom, and probably it was present in many cases not showing it openly. Nearly always it was felt to be due to separation from home; no one complained of fear of the sea or service dangers, no doubt because to admit this is a blow to self-esteem. An understanding of the anxiety state, regardless of any specific causative factors, was sufficient to direct treatment of potential breakdowns along correct lines; reassurance was usually all that was required.

Depression.—This was only seen in its minor forms and gave no real trouble. Case 2 is a typical example selected among many.

Hysteria.—No clear hysteria occurred, though some cases showed hysterical features. A firm attitude was taken to all sickness because each man going sick meant added strain for the remainder; it is not feasible to carry extra men to replace those sick in times when man-power is short. Also discouraging hysterical reactions was the fact that all seriously ill patients were put ashore to hospital where possible and left behind on sailing; this prospect disturbed many of them, particularly if the hospital used was remote and infrequently visited. In addition, the extra discipline of being under medical care and the loss of shore leave while sick were potent deterrents. Beaton (1918) also comments on the rarity of hysteria on board H.M. ships.

Apart from hysteria, the exaggeration of minor symptoms, or "near-malingering," was sometimes seen. It was apparently staged to obtain advantages, such as light duty or medical comforts, and it ceased to arise when met regularly with a sceptical, though not cynical, attitude. Sympathetic treatment merely encouraged such patients to try again, especially at times when Church or Divisions was the alternative attraction.

Resentment.—This was a very common state of mind, usually in the form popularly called "chokker" (from "chock-a-block" as applied to a tackle when it cannot be drawn any tighter). It was partly a feeling of irritation at something felt to be unnecessary, partly anger and aggressive feelings, and partly mere sulking. Although a tense frame of mind it rarely gave rise to affective outbursts, mainly because tactfully handled by those in charge; when trouble did arise it was usually because of a lack of such tact. Normally, the tension was released in a thin stream of nattering complaints, "moaning" or "dripping." The state of "chokker" seems to be the natural reaction of people unaccustomed to discipline when they are subjected to it. It improves with time because acclimatization and reorientation occur, but in a rigid personality it is never far below the surface and is easily produced by minor injustices.

Delinquency.—A number of ratings were absent without official leave, some of them more than once, and there was over-drinking and over-eating when opportunity allowed. A certain amount of V.D. appeared as a secondary result, but was much less in 1942 than in the previous years. The improvement was probably due to alcohol rationing, dilution of the complement by men fresh from home, and improvement in the mood of the ship. There was always a tendency to "cast loose" and "let off steam" whenever possible, and this would have led to less trouble if better facilities for vigorous recreation had been available at all ports. The incidence of misconduct was determined by the severity of the reaction to foreign service in the individual concerned, by the opportunities offered and by the absence of immediate deterrents. None of these factors was capable of much modification on the spot, for each was predetermined by the exigencies and customs of the service and the nature of the ports visited.

Alcoholism.—There was less addiction than might have been expected, perhaps because alcoholic drinks were expensive and none too plentiful. Everyone discovered the beneficial sedative effect of alcohol; most used it also on social occasions, and some as a narcotic; but on the whole there was very little abuse. In only one case reactive addiction and a "fugue" occurred, with serious results.

Seasickness.—In one case this caused severe disability; after being twice mistaken for a "ruptured ulcer" he was found unfit for sea service in small ships. As a general rule the reaction showed psychogenic features, namely, an onset under mental stress, a tendency to severity and chronicity in neurotic persons, a marked response to suggestion and persuasion, and spontaneous cure when the stress became an accustomed part of the environment and introspection ceased. Anxiety was a factor, but introspection was necessary also; hence acute fear abolished the

condition because it left no surplus of attention for the stomach. The condition also seemed to have some hysterical features, and these usually disappeared after persuasion. In most cases a firm, apparently unsympathetic attitude and the suggestion that "it would pass off later" were effective treatment. I was not able to adopt this attitude towards myself, however, so that I only overcame the weakness slowly, but I was at least able to believe that I was making slow progress and so maintained it. In the course of time great improvement occurred.

Conclusions.

As already pointed out, few men escaped with no reaction who had been exposed to foreign service strain for more than two years; at the same time it is proper to say that the number of cases requiring psychiatric attention was small, in view of the severity of the conditions amazingly small, and the bulk of the complement maintained a reasonable standard of efficiency without assistance. A quantitative estimate for the whole Navy cannot be deduced from the experience of one ship, but Beaton (1918) estimated that about 20,000 ineffectives occurred during the 1914–18 war from psychological illness, of which about 41 per cent. were classified as neurasthenia. Certain suggestions are therefore made in the hopes of reducing this type of illness to a minimum.

Firstly, two years are enough to produce marked results in previously normal people if the conditions are severe, three years if less severe. In normal times these periods are used as limits, having been chosen, no doubt, because longer times were found to produce ill effects. The present series of cases confirms that these periods are as long as is safe.

Further, the uncertainty of warfare adds to the strain due to separation; if nothing obvious is happening the duties of the ship seem irksome and futile. Both of these troubles can be met by adequate propaganda in the shape of information as to what the ships are doing and why and, if possible, what is likely to happen next. Even giving a number of prophecies is better than giving none; at least there is something tangible about a statement of possibilities. Of course it is realized that the requirements of secrecy often prevent the giving of such information, but as much should be done as is permissible. In some cases the information available can be repeated in various ways.

Thirdly, it seems desirable that medical officers on detached service should know as much psychiatry as tropical medicine, if not more. In this sense, psychiatry implies a knowledge of human nature, and an ability to handle men's problems and give good advice to them. Serious reactions would often be prevented if tackled early.

Efforts to provide vigorous recreation should be increased, particularly for ships which do much sea-time. The provision of extra dockyard staff might allow the release of key men during refitting periods so that they might benefit by leave ashore.

Under the severest climatic conditions, as in the Persian Gulf and Red Sea in summer, an extra issue of alcohol is of value as a sedative. In view of the need for copious fluid drinks, beer is probably more suitable than rum for this purpose.

Beaton (1918) recommends measures roughly corresponding to the above, which may be summarized as early diagnosis, recreational facilities and propaganda.

Rehabilitation, as suggested by Newman (1944) for prisoners of war, does not seem to be required in average cases, for these improve quickly at home without special treatment. The difference between a prisoner of war and a sailor, however, from the point of view of the psychiatrist, is probably one of degree only; Dr. Johnson's remark, perhaps, camouflages a genuine piece of wisdom.

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LOSS OF SPATIAL ORIENTATION, CONSTRUCTIONAL APRAXIA AND GERSTMANN'S SYNDROME.

By E. STENGEL, M.D.Vienna, L.R.C.P.Ed.

From the Royal Edinburgh Hospital for Mental and Nervous Disorders.

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IN recent years important additions to the knowledge of the symptomatology in cases with involvement of the parietal lobe have been made. Both constructional apraxia (Kleist, 1922) and Gerstmann's syndrome, consisting of finger-agnosia, disturbance of right-left orientation, agraphia and acalculia (1924) have been related to lesions of the angular gyrus of the dominant hemisphere. Before the description of those symptoms, a loss of spatial orientation had been described in cases with lesions of the same localization. Balint (1910), Riddoch (1917), and others had observed that symptom in single cases, but the most comprehensive description was given by Gordon Holmes (1918), who studied it in a case-material of war injuries. When Holmes and his co-workers published their observations, constructional apraxia and Gerstmann's syndrome were still unknown. Loss of spatial orientation as a fully developed symptom is rare, while the other two disorders are not uncommon. For this reason the psychopathological relationship of those symptoms is still insufficiently understood. The following case offers an opportunity for studying the problem:

Mrs. F. M—, nurse, aged 40, was admitted on May 14, 1943. She had been healthy until August, 1937, when in the fifth month of her first pregnancy she fell ill with eclampsia. Premature labour was induced. On the following day she could not talk or respond to questions put to her. After a week she began to talk, though she had difficulty in finding words. The patient recovered her speech during the following months and since 1938 her condition has been stationary. Ever since the onset of her illness she has been unable to find her way about. She ran into things, as if she could not see. Reading and writing were gravely impaired. Since 1938 she has had occasional fits of the major epileptic type, the last one 18 months prior to admission.

The patient, who was a most co-operative and willing witness, corroborated those statements. Her speech was intact except for an occasional slight difficulty in word-finding. She always named objects correctly. In conversation no impairment was noticeable. Memory and retention were unimpaired, provided the tests did not imply spatial orientation of the use of numbers. Her general physical condition was satisfactory. Respiratory and cardio-vascular systems healthy, B.P. 150/90. Apart from exaggeration of the knee and ankle jerks, right more than left, and the symptoms described below, the neurological findings were negative. Acuity of vision normal; fundi normal; no defects in the visual fields tested on the Bjerrum screen. Blinking reflex either diminished or absent both sides. No ocular palsy. The accommodation for near objects was often lacking; the patient as a rule failed to converge on approaching objects. She did this, however, quite well when the object was her finger or when she looked at the tip of her nose.

The patient moved about slowly and cautiously, like a blind person who is moving in completely strange and even dangerous surroundings. However, she did not use her hands freely to find her way with the help of touch. She usually kept her arms bent, and used her hands only for touching near objects. She was constantly afraid of knocking into things—which actually happened on many occasions. When asked to sit on a chair she often sat beside it, taking up a squatting position. She could sit down only after she had orientated herself with the help of touch. Her ability to estimate distances was severely disturbed. In trying to grasp objects she usually underestimated the distance. In walking up and down steps she had to feel her way with the tips of her toes and missed both the height and depth of the steps. She was generally unable to orientate and localize correctly in space objects which she saw. She committed errors in pointing to an object that was in her central vision, and failed even more when the object was in the periphery of her visual fields. This defect could be observed in all actions of her ordinary life in which she relied on visual guidance. She had no difficulty in localizing by touch. She brought her finger to any point of her own body that was touched by the examiner,

but when the stimulus was of the nature of a stroke she failed in recognizing its direction and extension. She equally failed in appreciating the correct sites of two or more simultaneous or successive stimuli on her skin. She was at a loss when requested to point to corresponding parts of another person's body. The patient did not as a rule confound above and below in her ordinary behaviour.

In addition to the disturbance of absolute localization, i.e. the ability to determine the position of objects in space in relation to herself, there was a disturbance of the relative localization, i.e. the ability to estimate correctly which of several objects was nearer to her. The appreciation of length and size was defective. Lines of different sizes appeared equal to her unless they were parallel. She did not fail, however, when the difference was very considerable. She could not demonstrate the length of familiar measures, such as a yard or an inch. Estimation of weights was equally disturbed, but when requested to compare two weights she could say which was the heavier one. The patient was unable to survey a multiplicity of objects. She could see at a time only one and sometimes two of several objects, but she was unable to state their number when it exceeded three. The topographical memory was gravely impaired. The patient lost her way in the ward and hardly ever found her bed in the dormitory. She could not give a description of the situation of her bed or the furniture in the room. Though she could describe correctly single objects shown to her, she failed when requested to visualize and describe familiar objects. When asked to describe the human body she named the extremities, but was unable to say what was between the upper and lower limbs. She equally failed when describing a tramcar, etc.

The right-left orientation was disturbed. When asked to turn to either side or to point to objects on her right or left she failed. However, she turned in the direction of a sound without error, though she was unable to point to the direction from which it came. The recognition of movements was defective. She was uncertain whether an object approached her or receded from her. This difficulty was responsible for her helplessness in traffic. The size of the object and its relation to her visual axis did not seem to make an appreciable difference. Vision in depth, though inaccurate, was not grossly disturbed. She never described a tridimensional object as flat.

The orientation on her own body was intact, except for the right-left orientation and the fingers and toes. While she was able to point to her eyes, her nose, shoulder, etc., and could name them without difficulty, she was unable to do so when individual fingers or toes were concerned. However, she never failed to recognize them as fingers or toes. She sometimes succeeded in naming the thumb and little finger. Naming, recognizing and presenting a particular finger were equally impaired, and the same applied to other persons' fingers and toes. She was unable to perform specified movements of her fingers to order or to imitate such movements. The same difficulty was encountered when she had to carry out to order or imitate movements with the arms and legs. She appeared to be unable to operate with her extremities in space, and this difficulty was obviously responsible for her inability to carry out certain purposeful movements.

Two sets of matches were laid out, each consisting of 5 which were either parallel or converging like the fingers of the hands; the patient was requested to choose one particular match, e.g. the middle match of the right set, etc. In this test she was equally helpless as when requested to choose a particular finger on her own or another person's hand or on a diagram of a hand. She also failed when she had to choose between the matches of one set only.

On examination for apraxia the patient succeeded in carrying out actions to order, except for those in which the orientation in outer space and the position of her extremities played a prominent part, e.g. when asked to carry out a military salute or to beckon or wave to a person she raised her extended hand and fumbled about helplessly. Her ability to recognize and use objects when shown them and the representation of the use of objects without seeing them was undisturbed, but there, again, difficulties arose when the position of objects in space was involved. In addition, she showed difficulties in handling a multiplicity of objects. Specimen responses: Use of key with and without object—correct. Button and unbutton a coat—correct. Lighting a cigarette in the examiner's mouth—movements correct, but she was unable to find the tip of the cigarette though she saw it. Putting on spectacles—correct on herself, but she failed in putting them on the examiner's nose owing to her inability to bring them into correct position. Shuffling of pack of cards—she was unable to hold the cards correctly in space. She failed when requested to demonstrate playing on an imaginary violin. When asked to hold her hands in prayer attitude she held them in the horizontal plane. Expressional movements were carried out correctly. The patient was unable to lay the table; she never succeeded in laying the cloth correctly and in putting knife, fork and spoon in their proper places. The actions carried out with the left hand nearly always presented a mirror image of her right-hand actions.

Constructional tests.—The patient was incapable of laying even the simplest geometrical figures with matches or bricks, or of copying such figures. When requested to copy a simple angle she would on occasion succeed, but its position in space was always wrong and often her construction represented a mirror image of the original one. She could not lay to order or copy a closed geometrical figure. As a rule she used both hands in those constructions. When requested to use one hand only she was even more helpless, irrespective of which hand she used. The right-hand work was always different from that of the left hand, the latter usually presenting a mirror image of the former. Her performances in these tests were very inconsistent.

Drawing.—The patient was unable to draw simple objects and figures, and she equally failed in copying drawings. When trying to copy simple lines she drew them in a wrong position in space, mixed up above and below, and usually produced something smaller. She sometimes succeeded in drawing a circle or oval, but always failed in drawing a figure consisting of several strokes. The perpendicular lines drawn by her were usually slightly sloping to the right when drawn by the right hand and to the left when drawn by the left hand. Asked to draw a compass she drew a triangle. When requested to fill in the missing part in a sketch of a face she first failed to recognize that anything was missing, and when this was pointed out to her she was unable to put the missing part in its proper place. When trying to connect two dots by a straight line she succeeded only when she put a finger on the dot she was aiming at. In attempting to copy Roman block letters she succeeded only with those which consisted of one line, such as I, S or O, but she failed when the letter consisted of several strokes, such as E, T or A. Then she produced a few strokes disconnected with each other. In drawing, too, the left hand usually produced a mirror image of the right. There was not only mirroring in the right-left axis, but also in the perpendicular and other planes.

Whenever a task involved *the conception of right-left* the patient was embarrassed and often asked, "What do you mean?" Her behaviour suggested that that conception did not exist for her. When asked whether the heart was on the left or right her first reaction was to put her hand over her heart, but she was at a loss to answer the question correctly. As a rule she made a guess whereby she more often described an object being on her right. She often would say first. "It is near."

The patient's knowledge of the relative position in the *vertical axis* of parts of the body or of familiar objects was unimpaired. She would point with approximate accuracy to the top and bottom ends of a long stick. However, she consistently failed when confronted with simple geometrical units. When asked which of two dots or strokes was above or below the other she was at a complete loss, and it was obvious that under those conditions the conception of above and below had no meaning to her. This was evident in drawing and construction. Her performance showed certain consistent features. When asked to draw a vertical line upwards or downwards she did it correctly, apart from the slight sloping. Requested to draw an arrow pointing upwards with either hand she drew a vertical line upwards, but consistently added the acute angle forming the head of the arrow on or near the bottom end of the line. When the arrow was to point downwards the head was put at the upper end.

The patient was completely at a loss when she was shown on the blackboard or on paper a horizontal line with a dot or cross above or below it and was asked to describe their relative positions. She was equally helpless when, instead of a dot, a coin was used. Specimen responses: A dot 2 in. above the horizontal stroke. (Examiner: "Is the dot above or below the line?") "It is near." Dot 2 in. below the line: "This one is higher than the stroke; no, it is nearer." A sketch of a house is drawn on a horizontal line. The patient recognizes the house at once: "It is under the line." ("What does that mean?") "I don't know." When told to imagine that the line was the ground on which the house stood, she said quickly, "The house stands as it ought to be," but she was still unable to say whether it stood on or under the line. The patient was quite unable to point out the directions of the compass on a map. When asked to point out north, south, etc., she pointed somewhere to the centre. She also failed in reading the time from the clock face whereby mirror-mistakes were noticeable, e.g. 2.40 was read as 20 to 3, 12.55 as 5 to 11, etc.

Writing.—The patient could write a short letter spontaneously, choosing mostly monosyllabic or di-syllabic words of a familiar nature, but she was unable to write successive words in a straight line. The words were written either successively higher or lower. When given a sheet of paper she would start anywhere and write successive words somewhere at random, often over the margin of the sheet. On many occasions she wrote one word over the other. The configuration of individual letters was correct except for those which make more than one single movement necessary. She failed in crossing her t's and dotting her i's. The t stroke or the dots of the i were found at the end, under, or in the middle of the word. The number of m and n strokes was often incorrect. The spelling was gravely impaired, especially for polysyllables, e.g. "moth, nouth" for mouth; "recest" for recent; "intensten" for interesting; "ontonaygyi" for occupied; "Jornburn" for Jordanburn; "longeh, lonthoho" for livelihood, etc. The spelling corresponded closely to the writing. Only words which were written correctly were spelled without mistakes. It was never possible to improve the written spelling by making the patient spell orally.

The patient was quite unable to put even the simplest words together from single block letters. She could not arrange them in the correct position and sequence, and failed in the same manner as in constructional tests. She was equally helpless in arranging single digits to a higher figure.

With the left hand the patient *mirror-wrote* in a rather imperfect manner, though fluently. She was quite unable to write normally with the left hand. She had never tried mirror-writing before, and was greatly surprised at her inability to write with the left hand in the same manner as with the right.

Single digits were written correctly except for the 5, the upper horizontal stroke of which was put somewhere to the right of the main part of the figure in writing with the right hand and to the left when she wrote with the left hand.

Writing on a line.—When asked to write on a horizontal line either on the paper or on the blackboard the patient always wrote below the line when writing with the right hand and always mirror-wrote above the line when using the left hand. When the line was vertical and she was requested to write on it she never turned the paper, but always wrote with the right hand at the right side of the line starting near it, and with the left hand she mirror-wrote away from the left aspect of the line. The same happened when the line was oblique. When asked to write under the line she did just the same as when asked to write on it. The conception of above and below did not seem to convey anything to her under those conditions. Closing of one eye made no difference. The patient always spontaneously expressed dissatisfaction with her performance, but could not explain what was wrong. When asked whether a word she had written was above or below the line she was unable to answer that question, but only said, " It is near the stroke."

The patient failed completely in typing, though she had been a good typist prior to her illness. She found individual letters only after a long search, and was unable to type even very short words.

Reading.—The patient could, as a rule, read single words correctly, irrespective of the number of their syllables, but she could not read consecutive words in their context with others. In this she sometimes succeeded when a short isolated sentence in big print was presented to her. Otherwise she left out words. When she had to read print in a book or newspaper she could not keep to the lines, but picked out words from consecutive lines at random. When the examiner pointed to the word following one she had just read this did not help her, nor could she point to it accurately herself. When requested to read a single word to which the examiner was pointing with his finger or a pencil she as a rule read some other word in the neighbourhood. The patient was aware of her inability to read normally. In fact, this was the symptom she felt most keenly.

Sometimes she failed even in reading single words, though she had grasped their meaning. The following specimen responses were typical of that deficiency. (Negative films): " Negative —I know what it is but I cannot say it. It is what you send to the Infirmary." When told the word she exclaimed, " Of course I knew it." (Leslie Howard): " He is a well known actor, but I cannot say his name." (Farm labourer): " Farm—it is not worker, but something like it." The patient was quite unable to read even short words backwards. The reading of numbers will be dealt with in the paragraph dealing with calculation.

The spelling of read words was often faulty. The patient mixed the letters up, putting them in the wrong sequence and often inserting letters which did not appear in the word. The patient understood the meaning of punctuation signs and common abbreviations.

Reading and writing of figures; counting; calculation.—The patient could read simple digits correctly and rarely failed in reading numbers below 20. With higher numbers she frequently made mistakes, mixing up the order of the digits; 43 she would read as 34, etc. Such mistakes became more obvious in figures of 3 and 4 digits. She seemed to succeed more often when the digits were written closely together than when there was some space between the digits constituting a higher number. She made similar mistakes in writing numbers. Single digits were written correctly, apart from the difficulty in writing the 5. In higher figures the position of the digits was often faulty and sometimes she would even write completely wrong digits, which on closer analysis proved to be the result of a tendency to write according to the spoken word or to perseveration, while in some she wrote wrong digits at random. The following specimens, written on dictation, illustrate these mistakes: 525 for 225; 755 for 754; 116 for 816; 10050 for 1450; 10044 for 1040, etc. When requested to put single digits written on cards together to a figure of several digits she failed in the same way as she did in putting together words from block letters. She could not read or write decimals; she treated them like other figures without taking notice of the decimal point.

Counting in normal sequence was correct up to 20, after which she left out numbers and got completely mixed up. She could count back only from 10 to 1. Asked to count from 1 to 20 leaving out every second number she made only one or two mistakes, but failed completely from 20 upwards.

The patient was unable to carry out in writing or orally even the simplest calculations, e.g. $11 - 3 = 7$, $7 - 5 = 11$, $3 \times 16 = 16$, $12 - 4 = 3$, etc. She was puzzled by the signs, and would often mistake plus for minus. She read the multiplication sign as the letter x and did not appreciate the meaning of the fraction stroke. She was unable to do everyday sums with pennies or shillings. The sense of numbers appeared quite generally affected. She estimated the population of London at about 100,000.

The patient could not count correctly more than three objects. When asked to count five flowers standing in front of her she said either three or four. She always under-estimated. The difficulty in counting objects was obviously co-determined by the difficulty in surveying and exploring surfaces. This was shown by the fact that she did not succeed in pointing successively to each of several objects in front of her, while to some she would point twice.

In memory tests she failed in reproducing numbers in the same way as she did in reading and writing tests. Her memory was not impaired otherwise.

Sorting tests.—There was no difficulty in sorting objects according to colour, material and practical use, but the patient failed when trying to sort objects according to their shapes and sizes.

Musical sense and sense of rhythm.—The patient had never been regarded as musical nor had she learned to play an instrument. She recognized familiar songs without difficulty, and she did not fail to notice when they were played or sung out of tune. She could sing folk-songs correctly unaccompanied or accompanied. She failed, however, in imitating simple rhythms. She missed the number of bars as well as the rhythm.

Awareness of the deficiencies.—The patient was fully conscious of all her deficiencies. However, the knowledge of her inabilities did not help her, though she was most anxious to do well and to correct her mistakes. As a rule she was satisfied when she had succeeded in the task.

Progress notes.—The patient remained in hospital for three months, during which period she had systematic training in writing and reading. When she left her writing had somewhat improved, especially with regard to the spelling, but on the whole there was no material change.

Discussion.

The most remarkable feature of this case was the combination of loss of spatial orientation, constructional apraxia and Gerstmann's syndrome. Each of those disorders has originally been described as an isolated feature. This case, in which they were united to one master syndrome, suggests that they have a common denominator which has not presented itself equally clearly in the cases reported in the literature. The symptomatology of this patient has much in common, though it is not identical with that of the cases of constructional apraxia studied by Mayer-Gross (1935, 1936). There is, at least in this case, no doubt as to the leading symptom, which is the loss of orientation in space. The question arises which is the basic disorder underlying that deficiency. According to Holmes there is in those cases a loss of the local signature of visual impressions. Considering that many other functions besides that of visual localization are disturbed, the loss of the local signature of visual impressions cannot be regarded as the primary deficiency. Holmes's cases, like those of other authors and the case described here, had disturbances in writing, reading and calculation, and it is very likely that, had they been examined for constructional apraxia and Gerstmann's syndrome, those disorders would have been found to be present. Balint (1910) and Holmes (1918) attributed great importance to " the loss of visual attention," expressing itself in the inability to focus more than one object at a time. However, it is doubtful whether one is justified in describing those patients who are always aware of their deficiency and try their best to overcome it as inattentive. The analysis of their various disabilities invites a different interpretation. For acting purposefully in our environment it is necessary to comprehend the outer world as it presents itself visually as an organized whole, wherein objects are related to each other and to ourselves according to certain laws learned by experience. From the total of that environment we relate by a process of abstraction certain parts to each other and to ourselves. Thus, in the terms of the Gestalt psychology, purely geographical environment becomes behavioural environment (Koffka, 1935). The patients with loss of orientation in space seem to be unable to perform the above process, with the result that a single object apparently unrelated to its environment seems to absorb their whole attention. They behave like infants in that early stage of development in which the spatial relations of external objects have still to be learned by experience. In that stage the infant begins to build up the knowledge of the organization of the outer world by first relating single objects to himself only. There is in those patients no loss of visual attention, but an inability to direct and spread it in a purposeful manner.

A fuller understanding of this patient's behaviour can be gained by considering not only her deficiencies in terms of negative symptoms, but by analysing the actual performances and thus arriving at the positive symptoms in Jackson's sense. This patient had replaced the complex organization of spatial relations in the environment by a very primitive one. The only measure in that system is nearness, which she tried to estimate by the aid of touch. She was constantly afraid of objects which might be too near and endanger her physical safety. This primitive conception of spatial relations also appeared, possibly by a process of projection, in her notions of spatial relations of external objects to each other. Here, too, nearness was the only relationship which she could comprehend. She could not arrange objects according to other rules. She could only put them close together.* It has often been noticed that patients who showed a similar type of agraphia as this case would scribble words together in a

* The Gestalt psychologists have described the primitive tendency to group objects closely together (Köhler, 1935).

narrow space and over each other. Mayer-Gross (1935) has drawn special attention to this feature, which he called the "closing-in symptom." The primitive conception of space in which objects are only related by proximity explains this behaviour. It also may have been partly responsible for the consistent peculiarity which this patient showed when requested to write on a line. In that task there were two given points of relation, the one her own body, the other the line. By writing under the line she placed the written words nearest to both those objects while the writing with the left hand represented a mirror image of the right-hand writing. In addition, it seems likely that here the same mechanism was at work which forced her into mirror-writing and mirror-acting, and that a stroke represented the line of demarcation between the right and left activity spaces.* This became clear when the line was turned from the horizontal into the vertical plane, and the spaces below and above the line became the spaces to the right and left of the line respectively. That test demonstrated the presence of a strong tendency towards keeping apart the right- and left-hand activity spaces, viz. of an inability to fuse them into one. Possibly some awareness of the midline of the body was projected into the outer world. Schilder (1935) has pointed out that the awareness of the midline is often very strong in patients with brain lesions, and makes them hesitate to cross the midline in their activities. The mirror-writing and mirror-acting in our case suggests that under certain conditions of brain lesion the activity spaces of the two hands are strictly separated, and that obligatory mirror-writing may be due to the inability on the part of the left hand to adopt right-hand activities. The inability to fuse right- and left-hand actions must have a disturbing influence in all activities where success depends on such a fusion. The analysis of similar cases may throw light on the understanding of the physiological mirror-writing which, as Critchley (1928) suggested, may be due not only to latent left-handedness, but also to left "eyedness." There were no signs of latent left-handedness in this patient, nor did closing of one eye improve her performance. It would be interesting to apply the test of writing on a line with the right and left hand successively in other cases with mirror-writing and disorder of localization in space.

The constructional apraxia as well as the other features of apraxia which were apparent in this case were clearly derived from the loss of orientation in space as analysed above. It is equally obvious that apractic features in tasks implying the comprehension and control of spatial relations are the result of the same impairment. Those features which do not fit into any of the well-known sub-groups of apraxia may perhaps be fittingly called "spatial apraxia," of which constructional apraxia is an expression. The apractic symptoms which Holmes and Smith (1916) observed in their case with loss of spatial orientation seem to have been of that order. The dependence of constructional apraxia on space disturbance has been stressed by van der Horst (1934) and further elaborated by Mayer-Gross (1935, 1936), who studied the relations of that symptom to visual agnosia and to apraxia in Liepman's sense.

The problem of the psychopathological significance of Gerstmann's syndrome has given rise to a good deal of speculation. It is not intended on this occasion to quote the very considerable literature on that subject. The reader is referred to the bibliography provided by Gerstmann in his recent articles (1940, 1943). Gerstmann maintains that finger agnosia is primarily a specific type of autotopagnosia, i.e. a loss of body orientation restricted to the fingers. However, it is worthy of note that in cases of finger agnosia typical features of autotopagnosia involving other parts of the body never appear. Schilder (1935) has drawn attention to the fact that, apart from finger agnosia, autotopagnosia has been observed only in cases with diffuse brain lesions ever since it was described by Pick (1898). The fact that finger agnosia as a rule appears together with constructional apraxia suggests that it is the result of a space disturbance rather than a primary symptom. Lange (1930) attempted to deduce finger agnosia from the loss of the category "direction in space." Our patient presented a typical finger agnosia which extended to the toes, while otherwise the body orientation was intact. The orientation for fingers and toes was affected in the same way as the orientation for external objects. Lange (1933) and Muncie (1935), in discussing finger agnosia, have drawn attention to an interesting conception of Grunbaum (1930). This author, in review-

* The term "activity space" as describing the sphere in which an action is carried out was introduced into clinical nomenclature by Mayer-Gross (1935).

ing apractic phenomena, postulated a concrete and abstract activity in personal space and outer space. The automatic activities of healthy people recognize no frontier between the two. The hand holds a peculiar intermediate position between the two spaces. It belongs to the " dynamic body scheme," but is at the same time something comparatively independent, acting outside the body, connecting personal and outer space. This conception states clearly the peculiar position of the fingers, which in acting become to a certain extent external objects. The analysis of finger agnosia in this and other cases shows that there is in fact no agnosia for fingers. The patients never fail to recognize a finger as such correctly, but they are unable to distinguish between them, i.e. to judge their relative positions, just as our patient was unable to do with objects of the outer world or with individual digits forming a higher number. One might speak of a loss of the local value or of the local signature of the individual finger. Finger agnosia is the inability to appreciate the position of individual fingers amongst its fellows, and is an instance of the inability to locate correctly a part of a multiplicity of objects forming an organized whole. That this inability was not confined to fingers was shown by the test with the two sets of matches. The writer has found that patients with finger agnosia generally fail in this test.

The question arises whether we are justified in regarding the disturbance of the right-left orientation as an independent symptom. This also seems doubtful. Patients with such a disorder are unable to relate their hands to each other and to external objects in a scheme of spatial relations. The agraphia, too, can be regarded in this case as the result of the inability to arrange a multiplicity of units in space correctly, and of a secondary tendency towards filling the gaps at random. The spelling mistakes seem to be of the same origin.

The failure to relate a multiplicity of parts of an organized whole to others according to certain rules is responsible for the disturbance of reading which was characterized by the inability to follow the lines. There was in this case an additional feature in the disturbance of reading which deserves special comment. The patient would sometimes be able to grasp the meaning of the word, yet fail in reading it correctly. It can be assumed that normally when reading we instinctively form a general picture of the whole of a word or sentence before we proceed to direct our attention to the constitution of those units. Both those processes are obviously necessary for correct reading. The second involves an operation which was impaired in this patient, so that she was sometimes left with not more than a general idea of the meaning of the word. One can produce a similar failure in normals by exposing in the tachystoscopic experiment a word or sentence for a fraction of a second only.

One of the most interesting features of Gerstmann's syndrome is the association of finger agnosia with acalculia. This combination recalls the fact that the child learns counting and calculating with the help of the fingers. The usage of the word " digit " reflects that connection quite clearly. The fingers present the earliest and most easily accessible example of a multiplicity of objects, and many grown-ups still use them instinctively for simple arithmetic. Strauss and Werner (1939) have demonstrated the coincidence of a mild degree of finger agnosia with a retardation in the development of the primary number concept in mentally defective children. It would, however, be erroneous to derive the acalculia from the finger agnosia, which, as has been suggested above, is itself the result of a more general disorder. It has been pointed out by Bergson and others that arithmetical operation imply some kind of spatial visualization. This can be corroborated by self observations. The patient's mistakes in writing and reading numbers demonstrate that the difficulty lies in the correct assessment of the position of the individual digits constituting the figure. A similar participation of the spatial element may have been responsible for the difficulty in reproducing simple rhythms. The fact that we control our environment chiefly by the sense of vision results in a participation of the spatial element in nearly all perceptive functions and their disturbance by loss or reduction of that element.

It may be argued that the derivation of Gerstmann's syndrome and constructional apraxia from the inability to relate objects to each other in space is not applicable to those cases in which the symptoms appear isolated, without a comprehensive loss of spatial orientation. Considering, however, that in our case those symptoms were quite typical, though clearly parts of a wider syndrome, one is justified in

assuming that in this patient a function was severely affected which in other cases had suffered only partially. Cases such as the one presented in this paper suggest that constructional apraxia and Gerstmann's syndrome, when occurring isolated, are incomplete or abortive appearances of the syndrome exhibited by our case. Clinical experience shows that Gerstmann's syndrome rarely, if ever, occurs unassociated with symptoms of constructional apraxia, which is an expression of a disorder in utilizing space. The view that loss of spatial orientation, constructional apraxia and Gerstmann's syndrome are closely related is strengthened by the anatomical findings reported in the literature. Constructional apraxia and Gerstmann's syndrome were found to be associated with lesions of the angular gyrus of the dominant hemisphere, while in cases with loss of spatial orientation the same localization of the lesion was found bilaterally. It can be inferred, therefore, that the intact right gyrus angularis prevents the full syndrome from developing and allows only parts of it to appear. Why the incomplete syndrome should express itself by constructional apraxia or Gerstmann's syndrome or both is a problem the discussion of which is beyond the scope of this article.

In the absence of anatomical findings no statements on the localization of the lesions in this case can be made. The anatomical findings of Holmes justify the assumption that the symptoms were due to symmetrical vascular lesions affecting the gyrus angularis in both hemispheres. Thrombosis of cerebral vessels resulting from eclampsia is not very uncommon, and the bilateral distribution of localized lesions is often seen in vascular cerebral disease.

Conclusions.

A case has been described in which a syndrome consisting of loss of spatial orientation, constructional apraxia and Gerstmann's syndrome had developed as a result of vascular lesions in eclampsia. It has been demonstrated that both constructional apraxia and Gerstmann's syndrome are derived from the same basic disorder which underlies the loss of spatial orientation, i.e. the inability of the patient to relate in space objects which form parts of an organized whole to each other and to himself according to rules acquired by experience. The complex spatial organization of the outer world was replaced by a most primitive one, the only measure of which was nearness. It has been pointed out that the basic disorder is responsible for the constructional inability, for the "finger agnosia," for the characteristic disturbances of writing and reading and the acalculia, as well as certain apractic features which do not fit into the known types of apraxia. A special feature of this case was mirror-acting and mirror-writing, which appeared to be the result of an inability to fuse and co-ordinate right- and left-hand activities.

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ACUTE CONFUSIONAL INSANITY AND DELIRIUM.

By EDWARD S. STERN, M.D., M.R.C.P., D.P.M.,
Medical Superintendent, Central Hospital, Hatton, Warwick.

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THIS condition, in which severe confusion, disorientation, and restlessness are the principal features, appears to have been first clearly described by Bell (1845), who noted that about 2½ per cent. of the patients admitted to his asylum showed a particular syndrome: they were normal people who were admitted after about a week's acute illness; their appearance and speech suggested fever and delirium like a typhoid state; understanding was limited; they were apprehensive, with distressing but confused delusions; they disliked and suspected their food, and were not sensible enough to be thirsty; they tried to get out of bed, were sometimes violent, and struggled strongly when held. The course of the illness was rapidly downhill, but about a quarter of the patients suddenly made a complete and permanent recovery at the end of two to three weeks, the remainder dying in the same time. There were no specific post-mortem findings.

A better known description is Chaslin's (1895), but it is probable that he included some cases of other psychoses. He noted that there is a variable incubation period, and described various types. The termination was by recovery, chronic confusion, or dementia—these latter groups would now be accounted dementia praecox or, ingenuously, by " la mort, soit dans le cours de la maladie, soit à la fin."

The syndrome has been given various names: acute confusional insanity, acute delirious mania, Bell's mania (Kraines, 1934), collapse delirium, delirium grave, exhaustive or hyperactive mania, idiopathic acute delirium, specific febrile delirium, toxic-infective psychosis, toxic-infective-exhaustive psychosis, and typhomania in English; while foreign names include amentia (U.S.A., Holland and Italy), *délire aigu* and paranoia hallucinatoria acuta. Bleuler (1923) includes most of the cases, with paranoia, paraphrenia, and dementia praecox, in his motley schizophrenic group, and the rest under the heading " organic syndrome." Henderson and Gillespie (1936) deny its existence as a clinical entity. Names that include the word " mania " are misleading and should be avoided, for the patients do not show the characteristic triad of emotional exaltation, flight of ideas, and psychomotor acceleration. The change in mood is inconstant and more often to depression than exaltation, thought is too muddled to be quickened, and volition is lost. Acute delirious mania is a term applied to the syndrome when accompanied by pyrexia—a sign which is insufficient to merit a separate group.

The subject has been reviewed by Curran (1934), whose cases were all apparently due to purely physical causes, and he has made another contribution to the subject (1937) in which he states that 75 per cent. of his hundred odd cases recovered within three weeks. This experience is at such variance with that here recorded on unselected cases, even if it be weighted unfavourably by including some possible instances of organic dementia, that it seems that Curran's experience was unusually favourable because his cases were drawn from institutions that accepted only mild cases of mental disorder. The absence of cases of psychological origin from his series is difficult to understand.

In this paper it is proposed to show that the aetiology may be physiogenic or psychogenic, but that all cases depend on a similar mechanism. To the physiogenic group the term " delirium " will be applied, and to the psychogenic the term " acute confusion." The cases studied were all that were admitted to the Leicester City Mental Hospital during a consecutive period of 56 months. In that city there are no observation wards or other mental institutions able to deal in any way with persons showing gross behaviour disorders, and so there is reason to believe that all severe cases have come under this survey.

Out of 1,043 direct admissions there were 51 cases of acute confusion and delirium (5 per cent.). In 30 of them the family history was investigated, and in only six of these was it positive for mental disorder of any sort. Cases of alcoholic insanity, cerebral syphilis, concussion, epilepsy, and puerperal or pregnancy insanity were omitted, since they require separate consideration, although there is evidence that similar mechanisms operate in at least a proportion of them. Mixed cases, e.g. those passing from confusion to another psychosis such as dementia praecox or melancholia, were also excepted, since they have mixed aetiological factors, which would complicate the investigation.

Delirium.

Table I.—*Fatal Cases.*

Number.	Sex.	Age.	Duration of illness from admission to death.	Cause of death.
1	F.	64	7 weeks	Right frontal tumour.
2	F.	67	12 ,,	Pernicious anaemia.
3	F.	65	4 ,,	Bronchopneumonia.
4	F.	55	5 days	Subarachnoid haemorrhage.
5	F.	75	1 day	Carcinoma of breast with secondary deposits in lungs.
6	F.	59	5 days	Cerebral haemorrhage.
7	F.	70	9 weeks	Carcinoma of lung with secondary deposits in brain.
8	F.	53	2 ,,	Broncho-pneumonia and arteriosclerosis.
9	F.	38	1 week	Pellagra (imbecile).
10	F.	67	3 days	Bronchopneumonia.
11	F.	62	4 weeks	Thyroid tumour.
12	F.	58	3 ,,	Cerebral embolism.
13	F.	68	1 week	Carcinoma of cervix uteri and auricular fibrillation. (No P.M.)
14	F.	56	2 weeks	Apoplexy. (No P.M.)
15	F.	28	2 days	Influenzal pneumonia.
16	F	71	4 weeks	Bronchopneumonia, cystitis, and nephritis.
17	F.	75	12 ,,	Cellulitis and carcinoma of stomach.
18	M.	63	2 ,,	Cerebral arteriosclerosis and thrombosis. (No P.M.)
19	M.	66	1 week	Cerebral softening.
20	M.	46	2 weeks	Cardio-renal failure.
21	M.	71	2 ,,	Carcinoma of stomach and right middle meningeal haemorrhage.
22	M.	56	2 ,,	Lobar pneumonia and cerebral atheroma.
23	M.	66	7 ,,	Bronchopneumonia and arteriosclerosis. (No P.M.)
24	M.	45	6 ,,	Phthisis and perforated gastric ulcer (imbecile).
25	M.	55	7 ,,	Bronchopneumonia.
26	M.	64	1 week	Carcinoma of lung.
27	M.	53	2 weeks	Bronchopneumonia.
28	M.	38	5 ,,	Chronic encephalitis.
29	M.	56	1 day	Lobar pneumonia.
30	M.	52	2 weeks	Coronary atheroma and subacute nephritis.
31	M.	66	3 ,,	Carcinoma of lung with secondary deposits in brain.
32	M.	72	6 days	Bronchopneumonia.

There were 44 cases whose mental breakdown was directly attributed to physical disease, and whose histories all showed an absence of severe emotional stress. 32 of them died in the hospital (73 per cent.), all within three months of admission (Table I); 11 were discharged alive and mentally well (25 per cent.), but one of

these was suffering from secondary carcinoma of the breast with deposits in the brain and she is unlikely to have survived long (Table II).

TABLE II.—*Cases Not Dying in the Hospital.*

All these were discharged recovered or relieved mentally, with the exception of No. 43.

Number.	Sex.	Age.	Time in hospital.	Diagnosis.
33	F.	47	28 weeks	Secondary carcinoma.
34	F.	49	32 „	Bronchopneumonia.
35	F.	45	12 „	Cerebral embolism and auricular fibrillation.
36	F.	46	59 „	Microcytic anaemia (dull and backward).
37	F.	47	7 „	Pneumonia.
38	F.	69	8 „	Carcinoma of rectum.
39	F.	54	6 „	Pneumonia and nephritis.
40	M.	42	5 „	Naso-pharyngeal infection.
41	M.	33	6 „	Quinsy.
42	M.	42	4 „	Phthisis.
43	M.	40	1 week	Cerebral tumour.
44	M.	54	6 weeks	Phthisis.

Comparison with the total deaths in the City of Leicester during approximately the same period, classified according to disease and age, showed that the cases in Table I differed in certain significant particulars. As was to be expected, the proportion of deaths from cerebral vascular accidents was higher in our series, and so was that from pneumonia—perhaps because it is an acute disease with distressing dyspnoea. But the proportion of deaths from phthisis, heart disease, and nephritis is lower in our series, possibly because of their chronicity, during which the organism can adapt itself to them. On the other hand, we have a relatively higher number of deaths from carcinoma although the disease is so chronic, but two out of our seven fatal cases had secondary deposits in the brain, and the pain, and mental shock of knowing that he has cancer, may well drive the patient distraught.

ACUTE CONFUSION.

There remain seven cases in which no adequate organic cause for the illness could be found. In each of them an emotional upset was evident. They will be described in more detail.

CASE 45.—A simple-minded spinster, aged 58, a hosiery worker, who cared for an invalid and pampered sister, with whom she shared her house, was admitted on June 7, 1940. Her condition was one of severe confusion with no physical signs nor evidence of injury. After steady improvement she left hospital fully recovered on October 1, 1940. She stated that a few days before admission she had fallen on to her head in the back yard at home and that this had completely unnerved and upset her.

CASE 46.—An eccentric, single woman, aged 52, who had been allowed her own way ever since an attack of chorea when she was 12, was admitted on June 22, 1940. Fourteen years previously she had been jilted by her young man after an engagement of ten years, and she then had a "nervous breakdown." In 1938 another fiancé left her just before their marriage, and she had a second breakdown. Neither of these attacks was treated in hospital, and it was not possible to find out their true nature. The present one occurred on the eve of a family wedding. On admission she was utterly confused and disorientated, her conversation being limited to the wedding and whether she should wear silk drawers to it! She was discharged well on August 1, 1940. There was a history of a cousin having tried to gas herself two years before.

CASE 47.—A 19-year-old single girl, exceptionally small, weighing 5 st. 8 lb. and being well proportioned, had made few friends and had been nervous since falling down some steps at school. Shortly before her admission on August 22, 1940, she and her sister went to a swimming-pool together. A boy there dived on to her back, sinking her. Being a poor swimmer, she was panic stricken. She struggled out. As she got to the top of the steps the boy, in sport, pushed her back into the water. She went home, but was depressed and moody for a fortnight. Then, three days before admission, she became restless. Her parents tried to restrain her by force. She grew worse. On admission she was excited and restless pirouetting about the ward and

speaking in a stilted manner with a French accent. She was confused, disorientated, hallucinated—constantly seeing bears, and she had to be fed by tube. Recovery was gradual, but complete before her discharge on November 16, 1940. Her father had been in a military hospital in 1924 owing to a mental breakdown, and his sister was a patient in a mental hospital.

Case 48.—A single hosiery worker, aged 20, who was said to have been in hospital with kidney trouble three years before, was admitted on July 4, 1941. On June 12 she had registered for compulsory national service. The prospect of a change of employment demoralized her; nevertheless, on June 20 she was transferred to entirely new work. This overwhelmed her, as she was utterly unable to cope with it. She became more and more dazed, and on the 25th she said, "Oh, Mum, I'm going to die." Two days later she was so confused that she had to be sent to a general hospital, where all tests for organic disease were negative and her mental state deteriorated so that on July 4 she was transferred to the mental hospital. Here she was found to be completely confused, inactive and faulty in habits. She steadily improved, to become her normal self. Her I.Q. on the Cattell Scale was found to be 86, and on Raven's Matrix Test she scored 11/60, i.e. too little to be ranked on a percentile basis. When questioned about her illness she said that her new job had upset her. It appeared that she was a dull girl, who, although able to cope with her simple routine job, was quite unable to adapt herself to fresh conditions.

Case 49.—A single shop girl, third in a family of seven, had been brought up by a spinster aunt since the age of seven, after a severe illness, said to have been tuberculosis of the bowels. This aunt, a village schoolteacher, although kind, was extremely strict and, considering herself a superior person, she did not allow the patient to play with the other children, nor to associate with the neighbours as she grew up. On retirement the aunt took a shop at a tiny and remote seaside place and retained the patient as her assistant. Alas, this secluded shelter did not last; it was shattered by the war. The patient had to register for national service. She was terrified. She feared that she would now be thrown into contact with the world, which she had always been taught to dread and shun. In her distraction she gave short change to the postman, a middle-aged, married man, whom she had reason to dislike and distrust, for two years before he had forcibly kissed her. She had never dared tell of this rapacious assault. Now she felt that she had robbed him. She became more and more confused. The aunt dispatched her to her parents in the Midlands, and they immediately sent her to the mental hospital. She was admitted on October 15, 1941, and was then completely confused and incoherent. But her condition there steadily improved until she was discharged recovered on January 6, 1942, with an I.Q. of 86 on Cattell's Scale, and a rating that put her in the lowest 5 per cent. of the population on the Matrix Test.

Case 50.—An old single lady, aged 77, of independent means, was admitted on April 22, 1942. One of fifteen siblings, as a child she was disliked by her four stepsisters, but otherwise her life had been uneventful and she lived in a bungalow at a seaside resort, where she had numerous friends. A year and three-quarters before admission she was persuaded, owing to the war, to come and live with a rather hard-hearted half-niece, who took her as a duty, in a large East Midlands city. Finally she arranged to sell her old home, although this was a great wrench to her. She was quite overwhelmed by the mass of deeds and documents involved. Three weeks before admission they were received for her final signature. Her memory now began to fail. A week later she took to bed. Her mental condition continued to deteriorate and she alleged that the agents and vendors of her house were thieves. Her unsympathetic surroundings did not help her and she grew excited. The niece and her maid stayed up all night, fighting with her in order to keep her in bed. On admission to hospital she was pugnacious and wildly excited, screaming incoherently. Physically she was arteriosclerotic with aortic regurgitation and a blood pressure of 160/75. On the following day she was still confused and showed remarkable echolalia for all sounds. She occupied herself in imaginary washing, folding, and wringing like a presbyophrenic. The next morning her mind was clearer, and two days later she was sensible and rational, with insight, although still physically feeble with a blood pressure of 185/80. She grew stronger, and was discharged recovered on May 20, 1942.

Case 51.—A labourer, aged 57, accidentally caught his arm in a hoist in December, 1937, necessitating three weeks off work. In the middle of March next he complained of headache and pain in the left side. His doctor told him it was pleurisy. After a few days he began to rave, and had to be admitted to the mental hospital on April 9, 1938. He was then severely confused and thought that he was working some machinery. He had arteriosclerosis with an enlarged heart and a blood pressure of 175/85. Recovery was rapid, and he was discharged well but for a poor exercise tolerance on May 25, 1938.

These seven cases have one feature in common—they all followed a sudden severe emotional shock. Further, the illness was not immediate, but came on in a few days after a varying latent period which rarely lasted more than a couple of weeks. The cases themselves call for some comment. It is possible that Case 45 was really one of concussion, but the physical signs and course did not support this diagnosis. Case 46 was unusual, and it is possible either that the diagnosis was wrong or the history incomplete. Case 51 was of mixed aetiology, since there was an organic element as well as an emotional one.

It will be noticed that all the patients showed some personal peculiarity. Cases 45, 48 and 49 were backward. Case 46 was eccentric, Case 47 was *petite* almost to the point of being a dwarf, Case 50 was senile, and Case 51 suffered from cardio-vascular disease. It may be that these people, barely able to adjust themselves to their environment when all goes smoothly, cannot do so at all in the face of a cataclysm. This will be discussed later.

Other cases of similar emotional origin have been seen, but since they did not fall within the time limits fixed here, they are not recorded. Sometimes the shock is catastrophic, at other times it is less severe.

Discussion.

The cases of delirium generally occurred in older subjects (average age 56) than those of acute confusion (average age 44), and three-quarters of the former died but all the latter recovered completely. Delirium has indeed been recognized as a sign of impending death from classical times—

> Quos vult deus perdere prius dementat
> (Those whom the god wishes to destroy he first turns mad)

and in Shakespeare's day, as in the well known description of Falstaff's death (*King Henry V*, II, iii, 14):

> "For after I saw him fumble with the sheets, and play with flowers, and smile upon his fingers' ends, I knew there was but one way; for his nose was as sharp as a pen, and a' babbled of green fields."

In this respect it is to be classed not only with picking at the bedclothes and the Hippocratic facies, but also with Cheyne-Stokes breathing, pulsus alternans, and the death-rattle of pulmonary oedema.

The occurrence of acute confusional insanity following a sudden emotional shock was first reported by Lemos (1928). The insanity followed the news that her god-father's house had been destroyed by bombs in a revolution, and it is indeed to be expected that the condition would be more common amid the alarums and excursions of war than during the even tenor of peace. The first such English case was described by Parfitt (1932), and here the cause was a sudden family quarrel. The only English text-book giving emotional shock as a possible cause appears to be Ewen's (1933), and there it is simply listed with other hypothetical factors.

It may well be asked how it is that such diverse happenings as organic illness and sudden emotional shock can give rise to the same clinical picture of mental disorder. For answer we must examine the confused patient. He is in a helpless condition, unable to indicate his wants, needing to be dressed, washed, fed by tube, and attended to in all ways. His habits are faulty. In fact he is as helpless as a baby. It is evident that those habits that have been so fully formed by frequent repetition over the years that they have become second nature to him, have suddenly left him.

Now if we can produce a similar condition in the experimental animal by the same means, we shall be in a position to account for the matter. Such experiments have been performed by Pavlov (1927). He took puppies and painstakingly built up complicated systems of conditioned reflexes. Unless extinguished by special methods not germane to our present argument, these persisted intact except in two eventualities: they were all suddenly and completely lost if the animal fell sick or if he was involved in a sudden catastrophe, e.g. when the kennels were flooded (*loc. cit.*; pp. 313 and 397). The condition of the animals was then much as in our cases.

In later experiments Pavlov (1941) succeeded in producing experimental psychoses. These appear to correspond most nearly to states of delirium and confusion. The animals showed chaotic conditioned reflexes and recovered with three days' rest. Moreover he was unable to cause these psychoses at all in well-balanced individuals, although they appeared readily in castrates, strong unbalanced excitatory and weak inhibitory types. This is strikingly like the acutely confused psychotics (Cases 44–51) above, who all had abnormal personalities.

Another question arising out of the present investigation is whether the attack commonly recurs. The local population is a relatively stationary one and the opportunities for history-taking are exceptionally good. Nevertheless, except for

the indefinite history of two previous nervous breakdowns in Case 46, in only one patient (Case 11) could a definite earlier attack of acute confusion or delirium be traced, and here search of the hospital records revealed the following:

A single woman, aged 25, a staymaker, was admitted on March 10, 1903. She was said to have been well until her intended wedding day, four days previously. It was then discovered that her betrothed was already married. She became excited and took no food, although her sleep remained good. On admission she was dishevelled, excited, incoherent, and exhausted. A week later she was much better, but still sulky and querulous. In May she expressed the delusion that charges were made against her. The next month she was brighter, and, after a month's trial, she was discharged recovered on July 11. She was probably not pregnant.

The next attack, due to a thyroid growth and recorded above on p. 762, did not occur until after 36 years, in which she had remained well.

Conclusions.

1. From the mental point of view severely confused patients all show a similar clinical picture although there are differences in detail; aetiologically, however, they fall into two classes: (*a*) acute confusion, which is of emotional, and (*b*) delirium, which is of physical origin.
2. The condition is a definite clinical entity and includes acute delirious mania, which does not merit a separate class.
3. Uncomplicated cases of acute confusion usually recover within a few weeks.
4. Delirium more often occurs in older patients and is of grave prognostic import, most cases dying within a few weeks.
5. Most subjects who develop acute confusion are of eccentric, dull, or unusual personality.
6. Both acute confusion and delirium are of similar mechanism, being due to a massive loss of conditioned reflexes, and are analogous to the similar states that Pavlov produced in dogs.
7. Recurrence of this psychosis is rare.

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INSULIN TREATMENT IN NEUROSIS.*

By DALTON E. SANDS, M.R.C.P.Ed., D.P.M.,
Deputy Medical Superintendent, Sutton Emergency Hospital.

IN recent years the scope of various physical psychiatric treatments has been defined more clearly. Broadly speaking, continuous sleep for acute and subacute anxiety reactions, electro-convulsive treatment for depressions, insulin comas for schizophrenia with or without fits, malaria for G.P.I., and so on. In 1941 my colleagues, Drs. Sargant and Craske, described a modification of insulin shock therapy for treatment of war neuroses in the Services. In 1944 we find the method maintaining its effectiveness, its indications more definite, its scope widened through trial in various psychiatric states, and checked by control experiments. From the 850 odd patients so treated at Sutton I have selected some 320 as the basis of this paper, whose courses of insulin I have given personally. The great majority of this number are civilians, and the forms of their illnesses do not differ materially from those familiar in peace time. In properly chosen cases the results are as satisfactory as with Service personnel. The treatment is free from the potential dangers of other physical methods.

To outline the procedure.—Insulin is injected intramuscularly at 7 a.m. in quantity sufficient to produce a mild hypoglycaemic state, *not* amounting to light coma, with perspiration, flushing of the skin, and some drowsiness from which the patient can readily be roused to take breakfast at 9.30 a.m. Individual requirements in obtaining such hypoglycaemia vary from 10 to 100 units. The initial dose is 10 units, and is increased by 10 units daily until mild hypoglycaemia is evident. This degree of hypoglycaemia is terminated by the ordinary breakfast menu of the day, together with 12 oz. of mashed potatoes, the potatoes serving as substitute for glucose, since our supply of the latter is sufficient for emergency use only. If a patient shows signs of slipping into sopor he is at once aroused by a glucose drink and then given potatoes and breakfast. If unable to drink spontaneously, glucose is given by nasal tube or intravenously, though efficient nursing attention will prevent this stage being reached in all but a few cases. Late hypoglycaemic symptoms in the afternoon are rare provided that the intake at breakfast and lunch is satisfactory. While it is advisable to have the materials for the administration of glucose by nasal tube or intravenously at hand, in practice they are rarely needed, 1 per cent. needing intravenous and 5 per cent. requiring oral interruption with glucose. Treatment is given six days a week for two to five weeks, i.e. until gain in weight is no longer observed. The patient is weighed before treatment and then at weekly intervals, wearing pyjamas, or shirt and trousers only. During treatment a doctor should be on call, but with a well-trained staff he need only be present occasionally.

Complications are few. Excessive hypoglycaemia has its own remedy, as described. Patients are only allowed local leave while the course is proceeding, and if out of the ward they are supplied with a 2 oz. bottle of 33 per cent. glucose and are accompanied by another patient or staff. Occasionally a temporary mild excitement occurs towards the close of the hypoglycaemic period, chiefly amongst hysterics. Sodium amytal, gr. iij, or gr. vj, or phenobarbitone, gr. j, at 7 a.m. or 8 a.m. as required, will control this difficulty. Where the psychiatric symptoms of anxiety or hysteria are associated with an epileptic constitution, the hypoglycaemia may precipitate a fit, usually succeeded by some restlessness and excitement. Glucose should be given orally or intravenously at once, and subsequent treatments continued with the aid of epanutin or phenobarbitone *t.d.s.*

* Read at the Quarterly Meeting of the Royal Medico-Psychological Association, at 11, Chandos Street, London, W. 1, on February 24, 1944.

In general terms the *indications* for using insulin are (1) to accelerate or to initiate recovery in anxiety, in hysteria, and particularly in neurasthenic states of exhaustion or irritable weakness; (2) to aid other physical methods in the treatment of depressions and the most acute anxiety states. In either event the treatment is only of value where these clinical states are associated, as they often are, with metabolic change, producing loss of weight. A loss of 7 lb. in acute and 12 lb. in chronic cases is approximately the smallest change worth considering significant. Microcytic anaemia of iron deficiency type, and less often vitamin deficiency, are sometimes associated with this loss. This physical approach must be supported by as much psychotherapy as is possible during a few weeks' in-patient treatment, e.g. exploration under sodium amytal, and other short and practical psychotherapeutic techniques. Occupational therapy and finally environmental readjustment are also necessary.

As regards the chief clinical types, in depression this treatment does not influence the fundamental mood disorder at all. It is only indicated where (*a*) it is desired to improve the physical state of debilitated patients prior to giving convulsion therapy, and (*b*) in subacute depression, where the illness is mainly exogenous and essentially reactive to nutritional and social causes. I have in mind cases such as that of the small shopkeeper in a bombed area living in a gloomy, leaky, and often insanitary patched-up portion of a house, with his living attenuated by war-time restrictions, and many of his former clientele evacuated. It is no use telling them to start business somewhere else, and alternative local accommodation is usually not to be had. The prognosis under convalescent regime would be good, but they cannot afford three to six months for this. Their recovery can be stimulated to occur in three to six weeks by aid of insulin and some practical psychotherapy without their being worried too seriously by the financial loss entailed in hospital care. They can be fitted to carry on till times improve, and in such cases induced fits are not indicated in a first breakdown.

In acute anxiety state associated with loss of weight, the sense of well-being that insulin engenders accelerates the effect of continuous sleep, or of milder sedation with psychotherapy, in securing relief from tension and restoration of confidence. If a full course of continuous sleep is required insulin should be given either before or during the course, and I find a combined insulin-sleep method, on which I have been working recently, most useful where much tension and malnutrition exist together. The insulin regime in the morning is employed not as a safeguard for prolonged sleep, but for its own effect on the patient's physical and psychiatric condition. Continuous sleep is given for the rest of the day and night. The combination is not dangerous in practice, provided the staff are experienced in the manifestations of hypoglycaemia and the food and fluid intake ample.

The typical chronic anxiety state who has not lost weight rarely benefits with insulin. These cases should be distinguished, when considering insulin, from recurrent forms of anxiety where attacks occur at intervals of a year or more and may frequently show weight loss. In these cases insulin and psychotherapy produce a good remission and the role of sedation is minimal. The attacks are shortened, but relapses are likely to continue unless diminished by psychotherapy and special environmental readjustment.

In hysteria and in mixed conditions of anxiety and hysteria with weight loss, modified insulin is easily the most effective physical method. In fact, shock treatments are useless and can be harmful. Acute and chronic cases both respond well, often achieving a substantial measure of spontaneous improvement even before psychotherapy has been applied. Except where obvious conversion symptoms are present psychological treatment can, if necessary, be deferred until there is physical gain. It can then be given with greater effect and economy of time. There is one type of patient in the group needing particular reference, namely the anxious or hysterical patient with much irritability and weakness, suspicious, paranoid trends, and in conduct almost making an aggressively psychopathic impression. On admission such patients make wild and hostile statements, and adequate rapport for psychotherapy is difficult. After two to three weeks on insulin the flow of complaints about their ward conduct ceases, they begin cooperating, show symptomatic improvement and, in fact, a personality change for the better akin to that of the recovering psychotic. Their recovery can then be completed by psychotherapy.

Mode of action.—This is mainly metabolic and to a lesser degree psychological. It is probable that in human beings, as in other intact animals, the administration of insulin causes increased utilization of sugar by the tissues, increased storage of glycogen by the muscles and liver, metabolism is increased and the respiratory quotient rises. Furthermore, the brain metabolises carbohydrate as its main source of energy. Appetite is stimulated to a point quite beyond the patient's expectations and the increase persists throughout the day. I have known patients of previously poor appetite rather sheepishly admit to having two full teas, one in a local café and the other in the ward, in close succession. I would confirm Dr. Sargant's observation that if there is a failure to gain weight one is probably treating an unsuspected chronic case who has not really lost weight, but is constitutionally thin. A photo taken a year or two back is often more reliable and informative than patients' statements about their weight. They generally exaggerate the amount lost. Apart from this, I would add that failure to gain weight should stimulate search for undiscovered organic or functional illness, e.g. depression, though chronic conditions, such as bronchiectasis or G.P.I., did not noticeably limit the physical effect of insulin.

So pronounced a metabolic change, with weight increasing up to 1 lb. and more daily with a growing sense of well-being, can scarcely fail to be without suggestive psychological effect. With the sweating, flushing and drowsiness and keen appetite, the patient feels that something significant is being done for him, his faith in his treatment and himself begins to rise and the first step in the restoration of self-confidence is made. In these matters the control series showed a different picture which I will mention later.

Results.—Only 163 results were reported, because in the other cases continuous sleep, electrically induced fits and so on, complicated the picture. In general, these findings parallel the indications given more than mere figures would suggest. A 60 per cent. recovered and much improved rate is found in anxiety states and mixed states of anxiety and hysteria. The same group in depressions is 45 per cent.—an indifferent result which contrasts with the 60 to 80 per cent. combined recovered, much improved rate that we are accustomed to find in treating depressions by electrically induced convulsions. These results from insulin treatment in neurosis showed that only 6 per cent. failed to make definite improvement. Patients were able to be discharged in three to four weeks. There was no perceptible change in the few obsessionals treated.

Follow-up records produced 16 per cent. relapsed in six months.

		Anxiety hysterias.		Anxiety states.		Hysterias.		Depressions.		
A	Recovered	5	15·6%	15	24·2%	12	35·3%	9	25·7%	
A	Much improved	15	46·8%	23	37·1%	4	11·8%	7	20%	
B	Improved	10	31·3%	21	33·9%	15	44·1%	14	40%	
B	No change	2	6·3%	3	4·8%	3	8·8%	5	14·3%	
	Totals	32	100%	62	100%	34	100%	35	100%	= 163
A (recovered + much improved)		62·4%		61·3%		47·1%		45·7%		
B (improved + no change)		37·6%		38·7%		52·9%		54·3%		

Controls.—Thirty patients were used for this purpose. In the first group of ten patients the insulin course was interrupted after six days by the substitution of sterile water for six days, after which insulin was resumed. Collectively these ten patients gained 32¼ lb. in the first week with insulin, 10¼ lb. in the second week on water, and 45 lb. in the third week when again on insulin. On water one patient lost 4 lb., and in another four patients the gain in weight was apparently uninfluenced by insulin. No sweating was observed while on water, though one female patient managed to become quite flushed. Several patients complained that their appetite was poor or that "the insulin was not acting." In fact the prestige of the treatment slumped considerably in the ward in the water week.

In the second group of 20 patients, the test was not done in all the insulin patients in the ward concurrently as in the case of the ten just mentioned. New patients,

as they started treatment in company with others more advanced in the course, were given sterile water injections for the first week and insulin thereafter. Comparing the first week on water and the second on insulin there was, on water, a total gain of 23½ lb. in all patients and a loss of 7½ lb., as against a total gain of 90¾ lb. and no loss on insulin.

In either group there was a 4 to 1 improvement in weight in favour of insulin. In the first group nobody was aware of any test being done but the dispenser and myself. In the second group the insulin had to be labelled and was prescribed as "special" brand insulin. The nursing staff remarked that they did not think it was very active in producing hypoglycaemia. The routine of treatment was kept constant throughout with the same diet and potatoes.

Control Series.

Group A.—*Sterile Water Injections Substituted for Insulin.*

Number.	1st week: 6 insulin days. Change in weight.	2nd week: 6 water days. Change in weight.	3rd week: 6 insulin days. Change in weight.
1	+ 3½ lb.	+ ½ lb.	+ 3 lb.
2	+ 3 „	+ 1 „	+ 4½ „
3	+ 3½ „	+ 1 „	+ 3 „
4	+ ½ „	+ 1 „	+ 3½ „
5	+ 2 „	+ ½ „	+ 3½ „
6	+ 1 „	+ 2 „	+ 3 „
7	+ 2 „	+ ½ „	+ 6 „
8	+ 2¾ „	+ ¾ „	+ 8 „
9	+ 5 „	+ 3 „	+ 4 „
10	+ 9 „	− 4 „	+ 6½ „
	+ 32½ lb.	+ 10½ lb.	+ 45 lb.
		− 4 „	

Group B.—*One Week of Six Daily Sterile Water Injections followed by One Week of Six Daily Insulin Injections.*

Number.	1st week: 6 injections of sterile water. Change in weight.	2nd week: 6 injections of insulin. Change in weight.
11	+ 1 lb.	+ 3 lb.
12	− 2 „	+ 4½ „
13	− 1 „	+ 3 „
14	+ 2½ „	+ 3½ „
15	+ 3 „	+ 8 „
16	+ 3½ „	+ 6½ „
17	+ ¼ „	+ 2½ „
18	+ 1 „	+ 4 „
19	+ 3 „	+ 5 „
20	No change	+ 4 „
21	+ 1½ lb.	+ 7¾ „
22	+ ½ „	+ 5 „
23	− 4½ „	+ 9 „
24	+ 2 „	+ 4¼ „
25	+ 2 „	+ 2½ „
26	+ ½ „	+ 4 „
27	+ 2 „	+ 2 „
28	+ 1½ „	+ 3 „
29	No change	+ 3 „
30	+ 2 lb.	+ 5½ „
	+ 26½ lb.	+ 90¾ lb.
	− 7½ „	

In discussion there are a few points of interest. (1) I believe that amongst psychiatric patients in general there is a limited but definite field for this treatment. The majority of suitable patients are to be found in E.M.S. psychiatric units, general hospital psychiatric O.P. clinics, and in the medical and surgical wards of such hospitals where the anxious and hysterical nature of the somatic symptoms

is often unrecognized. A relatively small number of mental hospital patients are likely to be found suitable for this treatment.

(2) As a mere weight restorer insulin has, of course, been used in other branches of medicine from time to time, including conditions of malnutrition in children; 5—10 units *b.d.* will not give the required result promptly in neuroses. It is necessary to produce clinical evidence of hypoglycaemia to the point of sweating, flushing and drowsiness.

(3) In both anxious and hysterical conditions a rapid gain in weight was usually, but not always, associated with improvement. If a patient does not gain at least 2 or 3 lb. in the first ten days of the course there is little use in persisting with it. Treatment is stopped when definite gain in weight ceases.

(4) To produce the relatively mild degree of hypoglycaemia that this form of treatment required, one could not fail to be impressed by the wide range of dosage involved, i.e. from 10 to 100 or more units of insulin.

Examination showed the hysterias to be twice as sensitive to insulin as any other group. This increase in sensitivity was entirely due to the conversion hysterias, numbering 16 out of 33 cases, all showing hypoglycaemia on 10 to 40 units of insulin (except one), while the rest required 50 to 100 units for the same clinical effect. The one exception was given 60 units, but became severely hypoglycaemic on three occasions and was reduced to 40 units. Generally speaking the more complete the conversion reaction the greater the sensitivity. The more hysteria was mixed with anxious, depressive or schizoid trends, the better was insulin tolerated. In other clinical groups a few patients were found who would not tolerate more than 40 units without severe hypoglycaemia. These were nearly all either in the 50 to 65 age-group, or possessed of hysterical components in their make-up. No schizophrenics were found so sensitive and the number of pure anxiety states was insignificant. Whatever the theoretical implications of these findings may be, the practical need to give small doses of insulin in conversion hysteria and to be wary in advancing years is obvious.

Conclusions.

In the treatment of selected neurotic patients we find a modified form of insulin treatment, developed at Sutton, to be a valuable counterpart to psychological measures. By its use in the limited field discussed we can give quicker and greater assistance to those patients whose fight to readjust has been sufficiently stern to be reflected in physical deterioration.

The treatment is essentially psychosomatic in type. Lasting benefit to the patient can be obtained when it is correctly employed in conjunction with psychological or even other physical methods.

I would like to express my thanks to Dr. Louis Minski, Medical Superintendent, for his helpful suggestions and advice.

A STUDY OF ACUTE NEUROTIC DEPRESSION AS SEEN IN MILITARY PSYCHIATRY AND ITS DIFFERENTIAL DIAGNOSIS FROM THE DEPRESSIVE PSYCHOSES.

By G. T. Tayleur Stockings, M.B., B.S., Capt. R.A.M.C.

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Depression or dysphoria in its various forms is probably the commonest single symptom encountered in military psychiatry, and its differential diagnosis is often a matter of extreme difficulty. The author's observations, based on three years' experience as psychiatrist in a military psychiatric hospital, have shown that of a large number of cases admitted with a diagnosis of " depressive psychosis," by far the greater proportion are not psychotic at all, but are cases of an acute reactive neurotic disturbance, characterized by a variety of mixed anxiety, hysterical and psychopathic features, and combined with a marked disturbance in the sphere of affect and personality.

This syndrome in its fully developed form is rarely met with in civilian practice, and appears to be almost peculiar to military conditions; it presents a twofold problem, both in diagnosis and in therapeutics, because the treatment differs radically from that of the psychotic depressions, and the prognosis is invariably good.

The condition consists essentially of a failure to adapt to the radical change of life imposed by military service, and a high proportion of cases show evidence of previous mental instability. The personality types which most commonly develop this reaction are those with mild degrees of mental defect, psychopaths of the emotionally inadequate and antisocial types, the hysterical, and the anxious, worrying over-conscientious type.

Clinically the condition consists essentially of a severe depressive affective reaction, in combination with mixed acute hysterical, anxiety, or sometimes obsessional features in a variety of combinations, but with absence of psychotic features. The outstanding and constant feature, which overshadows all the other symptoms, is the dysphoria. Under it may be included all those conditions which have been described under the labels of " acute psychopathic state," " paranoid state," " paranoid hysteria," " reactive depression," " personality-disorder," and " anxiety hysteria."

The Clinical Picture.

The patient is usually admitted with clinical features predominantly those of an acute depressive state, and is invariably labelled with a diagnosis of " psychotic depression." The clinical signs may be either those of a state of depressed and sullen apathy, or of an agitated state with marked apprehension and increased mental tension.

In the first type the patient is the picture of abject misery. The expression is dejected, mask-like, and miserable, and the conjunctivae often injected as if the eyes were red with weeping. There is often a strong impression of sullenness and deliberate conscious exaggeration and dramatization; the patient exhibits a hostile and unco-operative attitude, and answers to questions are hesitant, monosyllabic, and have to be literally dragged out of him.

Apathy and motor anergia are often so marked as to amount to a condition of semi-stupor, the patient lying curled up in bed and paying no attention to his surroundings. Careful examination, however, reveals that this is due to intense emotional tension and preoccupation, and not to true cerebral retardation, as in the case of psychotic depression. In the second type, acute anxiety and agitation

re much more marked, and sullenness, non-co-operation and pseudo-retardation bsent; the condition approximating more nearly to a typical acute anxiety-eaction. The depression and its characteristic features will be more fully described vhen the differential diagnosis is considered.

Conduct-disorders are often found in the form of emotional and impulsive utbursts, transitory episodes of violence, and suicidal attempts; the last mentioned eing nearly always impulsive, dramatic, and ineffectual, with none of the calculated deliberation of the melancholic.

In the sensory sphere headache is invariably a prominent symptom; it is lways of the pressure-type, symmetrical and diffuse, and associated with intense nental distress and emotional tension. Functional gastric and visual disturbances re common, and insomnia is the rule, but the appetite is not usually affected.

Gross hysterical and anxiety signs are commonly found in both types, of which he commonest are tremors, tics, astasia-abasia, tachycardia, vasomotor disturbances, and hyperidrosis, with functional pains and paraesthesias. Motor paralyses nd anaesthesias of the gross hysterical type are not usually found.

Disorientation in time and space, memory-defects for recent events, fugue-states nd amnesias are common; these are most likely to be found in cases with a psychopathic history, and often the " amnesia " is not completely genuine, with a strong element of conscious malingering and exaggeration.

Subjective Symptoms.

The subjective symptoms of which the patient commonly complains are the headache, as already described; depression, usually described as a feeling of " being browned off," " fed up," " miserable," etc.; loss of confidence and feelings of insufficiency and inadequacy; morbid inferiority-feelings, such as that of " not being wanted," " laughed at," or regarded as " queer " by his comrades—i.e. a general feeling of heightened and intensified self-consciousness; inability to think clearly and concentrate; impaired memory and transient periods of confusion, usually described as " turns " or " blackouts," and feelings of acute and constant unpleasant mental tension, commonly described as " worry," or " always worrying," which may be diffuse, or attached to some particular problem, such as domestic and marital difficulties. A variety of phobias are often found, such as fear of crowds, bombing, guns, handling live ammunition, or air-raids. Irritability and intolerance to noise, with transient emotional outbursts of temper and violence for which amnesia is often alleged, are also common symptoms. Subjective complaints of insomnia, frequently exaggerated, are the rule.

Unreality and depersonalization symptoms are found in a number of cases, and in the author's experience this symptom is much more typical of a neurotic than a psychotic reaction.

Differential Diagnosis from Psychotic Depression.

It will become evident from the above description that the condition with which the acute depressive neurosis may be most easily confounded is an acute psychotic depression.

Indeed, the profound emotional and personality disorder in the former condition often invest it with a superficial resemblance to a depressive psychosis, which renders correct diagnosis a matter of extreme difficulty. The main features which differentiate the two conditions will now be briefly indicated and discussed.

It should be emphasized in the first place that the true manic-depressive psychosis is a rare condition in military psychiatry. The reason for this is that this condition, as do also the involutional depressions of later life, does not usually manifest itself until after the age of 30 years; and the age-group most commonly dealt with in military psychiatry is that of 18–30 years.

Psychotic depressions occurring under the age of 30 years are, in the author's experience, nearly always disguised schizophrenic episodes, and, if observed for a sufficient period, eventually reveal themselves in their true nature by the appearance of suggestively schizophrenic symptoms, rendering diagnosis relatively easy.

Taking the symptoms individually, the depression of acute neurotic states is found to have features which readily distinguish it from that of melancholia or

depressive schizophrenia. Although profound, it is always strongly appropriate, and in nearly all cases a precipitating cause is present in consciousness. Such causes are commonly domestic, especially marital, troubles consequent on enforced separation from home; inability to adapt to military conditions—the so-called "martial misfits"—found especially in mental defectives and psychopaths of the constitutionally inadequate type; long and strenuous hours of duty with excessive responsibility, especially in the case of men of the over-scrupulous worrying type; and repeated failure to achieve promotion, with resulting feelings of grievance, inadequacy and frustration—the so-called "justice neurosis."

There is often a strongly psychopathic history, in the form of delinquency, chronic absenteeism, episodes of aggressiveness and violence, or drunkenness; the sullen and apathetic type of reaction is the kind most likely to develop in these psychopaths.

In the depressive psychotic, however, the prepsychotic history and personality are often excellent; he has usually been a keen and efficient soldier or N.C.O., a good mixer, popular, and with a strong liking for Army life; the history is usually of an insidious and causeless onset of depression "out of the blue," with no adequate precipitating factors. In psychotics, again, hopelessness and apathy, rather than acute anxiety and tension is the rule; true cerebral retardation rather than sullenness, persecutory delusions and auditory hallucinations of accusatory type are usually concomitant symptoms; these are not found in the acute neurotic reaction. In agitated depressives the agitation is stereotyped, and usually associated directly with the delusional and hallucinatory features rather than with the symptoms of acute anxiety, and there is always a distinct element of the bizarre and unnatural which is never found in the acutely depressed neurotic.

Acute hysterical headache, somatic anxiety signs, tremors, tics, amnesias and fugue states are much more typical of the acute neurotic depressions. True hallucinations and delusions are never found with the neurotic depressions. These cases are often admitted with a psychiatric report of having been "acutely deluded and aurally hallucinated." Careful examination, however, always reveals that the hallucinations are either entirely of the hypnagogic type, or else merely nightmares; or, if they have occurred in a setting of clear consciousness, have been of the elementary or simple type—i.e. "buzzing" in the ears, "singing in the head," etc. Such sensations are never interpreted in the bizarre manner of psychotics. In cases with acute hysterical fugues or twilight states, the commonest form is that of terrifying noises, usually of guns, bombs, aeroplanes, etc., associated with vivid recurring phantasies of terrifying battle or "blitz" experiences.

The alleged "delusions" are usually found to be merely feelings of inferiority, inadequacy or morbid self-consciousness, which have been wrongly interpreted, and clinical evidence of true projection and dissociation is never found. A common example encountered is that of the depressed and anxious mental defective who has been the butt and laughing-stock of his comrades, or the victim of a bullying N.C.O., and whose "delusions of reference and persecution" are only too well founded on fact.

Other points which distinguish the neurotic-depressive syndrome are the relative frequency of minor degrees of mental defect shown by cases of this condition, as compared with the manic-depressives; the greater day-to-day variation in the intensity of the symptoms, which often become much less pronounced if the patient thinks he is unobserved, and are modified to a much greater extent by outside influences (visits of relatives, promise of release from service, etc.); and the fact that they very often tend to show a rapid and spontaneous improvement within a few days of admission to hospital, without any special treatment.

The most reliable diagnostic test, however, which has been found by the author to be almost specific, is the response to electro-convulsive therapy. In the depressive or depressive-schizophrenic, the application of three or four shocks nearly always produces a dramatic improvement; in the neurotic-depressive no improvement at all is produced, and some cases—the agitated and anxious type particularly—may actually become worse following the treatment. Further reference will be made to this in discussing the treatment of these conditions.

The response to narco-analysis in the depressed neurotic is always dramatic, with strong abreaction and abolition of inhibition and stuporose features, and the acute features can often be cleared up completely in a single session.

In psychotic depression the relief obtained is always transitory, and the general response is not nearly so good.

The other conditions for which an acute neurotic depression may be mistaken are simple schizophrenia, depressive-paranoid psychosis, and organic conditions, such as general paralysis with depressive symptoms. Schizophrenia simplex sometimes has an onset deceptively like that of the depressive neurosis, with depression, feelings of inadequacy, and emotional outbursts, the bizarre features with apathy and personality-deterioration being absent in the early stages. The diagnostic pointers are the earlier age of onset, absence of adequate causal factors, and the appearance, sooner or later, of typically bizarre and psychotic features; the response to anoxic-shock-therapy in the early stages is also a reliable test.

As already indicated, the neurosis may be easily mistaken for a paranoid-schizophrenic episode, particularly in cases where the principal complaints are of frustration, unfair treatment, and " victimization," and there is a strong sense of grievance against authority. In these cases careful inquiry always reveals that the " paranoid ideas " have a real basis of fact, genuine hallucinations and delusions are absent, and the condition rapidly settles down after admission to hospital without recourse to shock therapy.

General paresis with symptoms of depression and loss of efficiency should offer little difficulty. The later age of onset, evidences of organic nervous disease and serological changes should easily settle the diagnosis.

Course and Prognosis.

As already indicated, the course of these disorders is one of rapid spontaneous improvement, and the prognosis for complete recovery invariably good. Within a day or two of admission to hospital the acute depression, apathy and other gross features begin to clear up, and the patient rapidly becomes brighter and more interested and co-operative. Removal from active service conditions to a hospital ward is by itself often effective in producing a remission. The underlying psychopathic traits, however, remain unchanged, and the prognosis for return to duty is poor. The outlook is better in those who have broken down under stress of front-line service overseas; in these cases, downgrading to home service category and return to duty under more sheltered conditions can usually be considered, particularly where the history shows a good pre-neurotic personality. The military prognosis in those where the precipitating factor is domestic or marital maladjustment is generally poor.

Treatment.

In view of the tendency to spontaneous improvement and absence of any specific therapy, treatment is for the most part symptomatic. As already stated, shock therapy is generally ineffective in these cases. For one particular symptom, however, acute hysterical headache, it has been found to be of value; it has been found that this, one of the most distressing and otherwise intractable symptoms, can in nearly all cases be promptly and effectively relieved by three or four applications. It should be reserved for those cases where the headache is the most prominent and distressing symptom.

For cases with acute stupor, gross inhibition with emotional tension, amnesias and general unco-operativeness, narco-analysis with pentothal or amytal has been found to be the treatment of choice. Abolition of these symptoms can usually be effected by a single injection.

Benzedrine sulphate in doses of 10–20 mgm. twice daily has been tried by the author, but the results have not been striking. It does not affect the headache or the depression, and is contra-indicated in cases where there is much tension, insomnia and anxiety. It is, however, of value in some of the milder cases where the principal symptoms are mild depression with subjective feelings of asthenia and loss of energy. For cases with pronounced tension, anxiety and emotional instability, a sedative mixture *t.d.s.* containing full doses of bromide with chloral hydrate gr. ij–iij is often effective. Alternatively, for cases with much evidence of sympathetic overaction, carbachol (carbaminoyl-choline) 2 mgm. two to three times daily has been found to be effective. Insomnia and nocturnal restlessness are best treated by hypnotics in full dosage.

As regards general measures, rest and occupation are particularly beneficial; the simpler forms of psychotherapy are also employed, but these have a strictly limited application, particularly in the mental defectives, psychopaths, and in cases where the precipitating factors are the common ones of chronic marital maladjustment and conscious desire for discharge from the service.

Summary.

(1) The syndrome of acute neurotic depression and its clinical features as found in military psychiatry are described.

(2) The differential diagnosis from psychotic conditions with depressive features is discussed.

(3) The use of electro-convulsive therapy as a diagnostic test and its relative ineffectiveness as a therapeutic measure in these conditions is indicated.

(4) The rarity of manic-depressive psychosis in military psychiatric patients is emphasized.

(5) The close association of the neurotic-depressive syndrome with mental deficiency and psychopathic personality is indicated.

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PROLONGED MEMORY DEFECTS FOLLOWING ELECTRO-THERAPY.*

By M. B. Brody, M.D.(Sheffield), D.P.M.,
Senior Resident Physician, Runwell Hospital, Essex.

Levy *et al.* (1942) reported impaired memory in 8 out of 11 patients treated by electric shock. Impairment lasted from one to several weeks, and in one patient was present after several months. Grinker, discussing this paper, compared the psychometric and clinical picture following electro-therapy with that seen in the "punch drunk" syndrome, in which careful testing, he warned, reveals permanent damage. This to my best knowledge is the only note hitherto made that impairment of memory occurring during or after electro-therapy has any serious significance. The following case-notes revealing memory defects lasting a year or more suggest that Grinker's apprehensions may be justified.

Case 1.—Unmarried female, aged 48. Admitted with manic-depressive insanity in a depressed phase. She had 15 treatments in September and October, 1941, of which six produced *grands mals*. During the treatment she complained that she could not remember names and addresses of relatives and familiar friends. She became very apprehensive of the treatment, which she said was making her worse. She was discharged recovered in May, 1943. Interviewed recently, more than two years after treatment, she was well and working, but said that her memory still let her down sometimes. She said, "I cannot seem to remember but it comes back later on. It takes me a long time to remember. My memory seems 'slower.' It lets me down over just small things that I am doing, like posting a letter." She still finds it difficult to remember people's names, an especially striking example occurring only a few weeks ago. At first, she said, it used to worry her, but now "it does not because it is so much better." Her memory improved for about six months after the end of treatment, but has not changed since then.

An interesting point in this case is that a few months previous to her course of electro-therapy she had undergone a course of cardiazol treatment, which is usually thought to cause more apprehension and to be more unpleasant than electro-therapy. Nevertheless she had continued with this treatment, and had not complained of memory impairment either during the course or afterwards, whereas her electro-therapy had to be terminated because her memory disturbance worried her so much.

Case 2.—Married female, aged 32. An hysterical type, admitted with superimposed acute depression. She had four treatments, all of which produced *grands mals*, in March and April, 1942. She bitterly complained after each of memory disturbance, and the treatment was eventually stopped because, for this reason, she opposed it so strongly. She was discharged from hospital in April, 1942. She was readmitted for three weeks in November and December, 1943, with mild reactive depression, which rapidly cleared on adjusting the environmental situation which had precipitated it.

Seen 18 months after electro-therapy, she said her memory still failed her at times. "Incidents," she said, "occur on and off. I can go several weeks without trouble and then might get two or three in a day. One day three things were missing, the poker, the paper, and something else I cannot remember. I found the poker in the dustbin; I must have put it there without remembering. We never found the paper and I am always very careful of the paper." In her household duties: "I want to go and do things and go to do it and find I have already done it." She further explained: "For example, I looked for the duster in a drawer to dust another room. I looked all over for it and found that I had taken it into the room which I was going to dust. . . . I have to think what I am doing so that I know I have done it. . . . it is uncanny when you do things and find you cannot remember it." She, too, has difficulty when meeting friends: "I have met one or two people who seem to know all about me and I cannot remember anything about them. I look silly at them and I get frightened of meeting people." Her memory let her down in other ways too, but she found it impossible to describe them.

Case 3.—Widow, aged 54, admitted with mild arteriosclerosis and hypochondriasis. She

* Read at the Quarterly Meeting of the Royal Medico-Psychological Association at 11, Chandos Street, London, W. 1, on February 24, 1944.

had twelve treatments in July and August, 1942, with six *grands mals*. She was discharged from hospital in September, 1942. During the treatment she complained that she could not remember the addresses of her son and of other near relatives, nor the details of her financial affairs. Seen 18 months after the end of treatment, she admitted that her memory still lets her down. She also finds that her memory fails her mainly in familiar matters, such as placing people who seem to know all about her, thus embarrassing her. A striking example was that—" The other day I went to see some relatives. I have been there a lot and I know the house very well. I wanted to go to the lavatory and I went upstairs and could not find it. I had forgotten that it was on the ground floor." She, too, said that her memory repeatedly failed her, but she could not remember all the incidents. Her memory had improved for about nine months after treatment, but had since been stationary. " I do not think about it much because it is so much better, but it used to worry me a lot."

Case 4.—Married female, aged 45, admitted with agitated melancholia. She had a full course of electro-therapy in March and April, 1942, and was discharged recovered a month later. When she left hospital she was still complaining of some impairment of memory, particularly failure to remember place-names and addresses. This improved after a few weeks. She was readmitted in December, 1942, again in an agitated, depressed, and auto-accusatory condition. She still complained of some failure in memory, but this was thought to be due, not to her previous treatment, but to her preoccupation with somato-psychic delusions. Fourteen electric treatments were given between December 17, 1942, and January 4, 1943, of which only two produced *grands mals*. She was discharged recovered on January 6, 1943, and has remained well since.

On her return home she found her memory to be so bad that it worried her considerably. She found she could not recall how to cook dishes with which she was very familiar, and had to refer constantly to the cookery book. She could not remember where she had been accustomed to put things in her kitchen. She also complained of inability to remember names of places and persons, where she had met people, and so on. It must be remembered that she had been in hospital on the second occasion for only five weeks and that she was now cheerful and composed, and, although worried, quite ready, if the worst came to the worst, to accept this disturbance of memory as the price of her recovery. Matters improved in the next six months; but a year later she was still having difficulty with her memory. She wrote in January, 1944: " I find that my memory is now quite good for all practical purposes. I have accepted the fact that there are one or two apparently *permanent* blanks, but these do not hinder me from efficiently carrying out my daily duties. On occasions minor embarrassments have occurred, but, being well, I have been able to laugh them off. Perhaps I make more written notes of things than I used to, but I believe this is mostly necessary as one gets older." Pressed for further details she wrote: " Regarding the blanks I can only explain by giving one or two examples. I originally had a very good memory for places and people. About two years ago we moved into this house. I have not the slightest recollection of taking it over, or seeing it beforehand. Although detailed measurements in my own handwriting were produced, it awakened not the slightest chord of memory. Occasionally I concentrate in a determined manner, but so far can remember nothing more. Facing me on the opposite side of the road is the house I moved out of. I have entirely forgotten the layout of the upper part of the house, but know the lower floor perfectly. Three years ago (approximately) I undertook a journey to enter hospital for an operation on the rectum. I have a great interest in travel, yet I can remember nothing of the journey, the building, or the return home. I have just a memory of a painful recovery after the operation, and, as I progressed, a daily bath taken in a surprisingly rusty bath. I was not worried when I set out, and it was not my first operation and I can remember every detail of previous ones. There are many faces I see that I know I *should* know quite a lot about, but in only a few cases can I recall incidents connected with them. I find that I can adjust myself to these circumstances by being very careful in making strong denials, as fresh personal incidents constantly crop up. I do not worry over it, and find that I can manage very well, and am quite efficient in carrying out my duties. I am bright and alert, and see no reason to be concerned about patchy memories of the past." By " being careful in making strong denials " she means that although she may not remember people who meet her and claim to know her, she does not therefore deny their acquaintanceship.

Case 5.—Widow, aged 41, suffering from anxiety neurosis. This woman, an out-patient not admitted to hospital, had seven treatments with five *grands mals*, the last early in March, 1943. Following this she was enormously improved, but complained that she was very forgetful. A year later she still cannot rely on her memory. In a letter she says: " The following are some of the things I forget: The names of people and places. When the title of a book is mentioned I may have a vague idea I have read it, but cannot recall what it is about. The same applies to films. My family tell me the outlines and I am able to recall other things at the same time. I forget to post letters and to buy small things, such as mending and toothpaste. I put things away in such safe places that when they are wanted again it takes hours to find them. This is not very clear, I am afraid, but it is difficult to explain. It did seem as if after the electric treatment there was only the present and the past had to be recalled a little at a time." She is positive about the disturbance of her recall for place-names. A much travelled woman, she used to be able to recall the places that she had visited very clearly in detail and by name. Now she finds this very difficult. An interesting point she made is that her memory improved when her daughter was called up, thus lessening her household responsibilities. During her daughter's

week-end leave, when responsibilities and calls on her memory returned to their previous level, she again exhibited defects on which her children commented before she herself noticed them. She is not unduly worried by her disturbance and, like patient No. 4, willingly accepts it as the price of her improvement.

More patients could be quoted, but I have deliberately selected only from those who are fully recovered from their other symptoms, out of hospital, and whose statements cannot justifiably be accounted for by depression, feeling of inadequacy, disturbance of the stream of thought or other such psychotic or neurotic abnormalities. Only one patient had arteriosclerosis and that mildly, and none was at an age when it could be argued that incipient senile dementia was revealed with the passing of more striking psychotic or psycho-neurotic symptoms. Further, most of the statements were made, not as complaints, but as items of interest. The similarity of the statements is also convincing.

The memory disturbance seems to be mainly in connection with long-known familiar material, particularly names of persons and places and habits of work. Three of the patients make the point that they have to observe themselves carefully or to make notes so as not to forget to perform, or that they have already performed, routine items of their daily work. Here, again, long-known familiar material is involved. Another prominent feature is the difficulty the patients have in explaining or illustrating their loss, perhaps because every-day trivialities are for the most part affected.

These observations, if confirmed, have implications. Even though the impairment of memory for the most part affects trivialities and is one to which an otherwise well patient can adjust, it necessarily imposes a mental strain. It also contra-indicates electro-therapy in those, for example teachers and transport workers, in whom inability to remember names of persons and places may seriously impair working capacity. Finally, it implies permanent, or semi-permanent, damage to the brain which, as Grinker hints, may later have untoward consequences.

It is a pleasure to thank Dr. R. Ström-Olsen, Physician Superintendent of Runwell Hospital, for his interest in these cases and for his permission to quote them.

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SHOCK THERAPY IN THE PRESENCE OF PHYSICAL CONTRAINDICATIONS.

By M. STRAKER, M.D.,
Ontario Hospital, Whitby, Ontario.

[Received May 16, 1944.]

SINCE its inception, shock therapy has become rather more restricted in its field of application. During the initial phase of enthusiasm and trial it was used freely in all the functional psychoses, but now many observers are agreed that its main usefulness lies in the group of depressive reactions and the melancholias. The results in the schizophrenic group are generally disappointing. In reviewing a large series of shock-treated cases, Penrose (1) reports 1·4 per cent. more treated schizophrenics in hospital than expected in comparison with a control group.

The field of treatment has generally been further restricted to patients who are in an acceptable state of physical health. Smith, Hughes *et al.* (2), in discussing electro-shock in the psychoses, indicate a number of generally observed contra-indications to treatment. Included are evidences of cerebral lesions, inanition, especially if accompanied by prolonged inactivity or bed confinement, tuberculosis, heart and bone disease and others. One assumes, of course, that each patient before having this form of therapy receives a careful physical and neurological examination. The treatment is not without risk, and deaths, though uncommonly rare, have been reported in the literature (3, 4). Shock in the presence of organic brain disease has met with unsatisfactory results. Heilbrunn and Feldman (5) have reported the use of electro-shock in a small group of paretics. The treatments were accompanied by alarming cardiovascular and respiratory failure and had to be discontinued. It is incomparably safer, of course, to treat patients who are in good physical health, yet contra-indications to any form of therapy are never absolute. One has always to balance the risk of the particular therapy against the expected result, having in mind, in addition to other factors, the natural course of the disease.

At this clinic we have recently had good success in treating a number of patients with physical conditions which would excite caution in the use of shock therapy.

MATERIAL.

CASE 1.—A married woman, aged 52, was admitted to hospital in an excited, elated and over-talkative state which followed upon several minor depressive episodes in preceding months. The pertinent etiological factors appeared to be menopausal changes, the death in action of one daughter's fiancé and the approaching birth of a first child to another daughter whose husband was away in the army. Two years prior to admission the patient had suffered a hemiplegia of sudden onset, involving speech, the left face, right arm and leg. There were prolonged periods of unconsciousness and it was not expected that she would survive. However, after several months she could speak a little and she subsequently made an apparently complete recovery, with no neurological sequelae.

Following abrupt onset of the mental illness she remained under hospital care eleven months. She was constantly restless and noisy in spite of hydrotherapy, sedation and forced feedings. and lost weight and strength. At the time shock treatment was commenced, she had been in hospital ten months and weighed 78 lb. Physically she manifested no neurological findings, though she was never accessible for detailed examination. A total of ten electro-shock treatments were given. An interesting feature of the convulsive therapy was the repeated production of an orderly Jacksonian progression, beginning in the left upper limb, involving next the face and lower limb, then extending to the right side. There was marked improvement mentally, and a gain of more than 20 lb. She was able to leave hospital, the only symptoms still present being some irritability. This represents a case successfully treated in the presence of two physical contraindications, a recent cerebral lesion and inanition.

TABLE I.

	Age.	Psychiatric diagnosis.	Duration of illness.	Physical findings.	Pertinent medical history.	Type of treatment.	Number of shocks.	Results.
Case 1	52	M.D., manic	10 months	Inanition	Hemiplegia two years previous	Electroshock	10	Recovered.
„ 2	37	M.D., depressed	9 „	Increased deep reflexes; spasticity	Encephalomyelitis 18 months previous	„	17	„
„ 3	60	M.D., mixed	10 „	Hyperactive deep reflexes	Fractured skull; aphasia 10 months previous	„	11	„
„ 4	19	Catatonic; schizophrenia	6 „	Inanition; anaemia (Hb 57 per cent.); tachycardia	? Rheumatic fever; persistent tachycardia	„	12	„
„ 5	49	M.D., depressed	9 „	Atrophic, flaccid; paralysis left leg	Old poliomyelitis	Metrazol	9	„
„ 6	45	Involutional	17	Atrophic, flaccid; paralysis left arm	Old poliomyelitis; recent thyroidectomy	„	18	„
„ 7	45	M.D., depressed	6 „	Pneumonia R.L.L. during hospitalization	Negative	„	6	„
„ 8	53	M.D., manic	12 „	Healing fracture of ulna	Thyroidectomy one week before admission	Electroshock	8	„
„ 9	64	M.D., depressed	6 „	Inanition; Mild hypertension; anaemia (Hb 68 per cent.)	Periodic dizzy spells; occasional cardiac symptoms	„	10	„
„ 10	55	M.D., mixed	6 „	Inanition; anaemia (Hb 73 per cent.); arteriosclerosis	Negative	„	10	Much improved.

CASE 2.—A married woman, aged 37, was admitted to hospital in a depressed, retarded and perplexed state following a serious domestic upheaval, a recent hysterectomy and a severe and prolonged physical illness which had diminished her resources and handicapped her in the management of her customary household duties. Eighteen months previous to our hospitalization the patient had developed a non-specific encephalomyelitis, following an upper respiratory infection. This confined her to general hospital care for over three months, and there followed a prolonged convalescence in which the main persisting symptom was weakness of both legs. The initial findings were fever, leucocytosis, one hundred lymphocytes in the spinal fluid, an increasing weakness of the lower limbs, together with bladder retention. Positive Babinski was elicited bilaterally over a prolonged period. During this illness the patient remained mentally clear.

While under our care the neurological finds were consistently hyperactive deep reflexes in the lower limbs and a mild degree of spasticity. Under conservative treatment the patient was rapidly losing ground, and it was felt that shock therapy would be justified. After twelve induced convulsions the patient had greatly improved. However, a review of the tangled domestic situation was again followed by some depression, indecision and feelings of unreality, and five more shocks were given. The patient was then judged completely recovered and was able to leave hospital to carry on her usual tasks. No complications arose during the convulsive procedure.

CASE 3.—A widow, aged 60, was admitted in a depressed and agitated state. There was a history of several previous depressions with recovery. Eight months previously she had been struck by a car and suffered a fractured skull together with some brain damage. At that time the fracture line was clearly visualized crossing the middle meningeal artery and operation was considered, as she was unconsicous about four hours and manifested a temporary motor aphasia. She made a gradual recovery neurologically, but mental symptoms arose shortly, and she was finally admitted to us.

Examination revealed the typical findings of an agitated depression. She was hallucinated in several fields, refusing food, and a difficult nursing problem. Neurological examination was negative. After a trial of more conservative treatment had failed to influence the situation electro-shock treatment was begun. A total of eleven convulsive shocks were given, with complete recovery, and the patient was able to leave hospital.

CASE 4.—A single girl, aged 19, was admitted to hospital in a mute, stuporous, negativistic state. She was completely inaccessible and incontinent and refused nourishment. The illness had developed gradually, and apparently arose from a long period of bed confinement on the orders of her physician because of persistent tachycardia and supposed heart disease.

The physical findings were a persistent tachycardia, ranging between 110 and 140, a marked secondary anaemia (Hb 57 per cent.) and a state of marked weakness and inanition following upon prolonged rest in bed and refusal to take nourishment. For weeks the main concern and aim of treatment was to keep this patient alive. Regular tube feedings, iron and liver extract and other supportive measures were undertaken. With the issue still in doubt, and the patient only weighing 72 lb., shock therapy was undertaken. A total of twelve electro-shock treatments were given with marked improvement in both the physical and mental sphere, and the patient was able to leave hospital. No complications were noted.

In addition to these cases, presented in some detail, there were treated successfully two patients with old poliomyelitis completely paralysing one extremity, one patient with a healing fracture of the ulna, one patient two weeks after recovery from an observed pneumonia, and two other patients in an emaciated and feeble state (see Table I).

COMMENT.

No complications occurred in any of the ten cases. It is interesting to note the type of seizure consistently obtained in Case 1. This may be taken as definite evidence of an existing cerebral lesion in this patient. The results were extremely gratifying. Nine patients have recovered and are out of hospital. One patient is still convalescing following the completion of treatment and will shortly be discharged. In the first case the patient had been hospitalized for ten months without improvement. The three cases suffering with inanition were threatened with death from exhaustion. In all the other cases a trial of conservative therapy had failed to produce improvement before shock therapy was instituted. It should be emphasized that less drastic measures are unquestionably preferred, and it was only after considered judgment and free discussion of the risk with the relatives that this therapy was attempted.

SUMMARY.

Ten patients with defects generally believed to contraindicate shock therapy were successfully treated. The exercise of care in the selection of patients suitable

for shock therapy is recommended, but it is emphasized that physical contra-indications are only relative.

Where shock is the treatment of choice in patients with moderate physical disabilities, one may proceed with a reasonable margin of safety.

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NON-OBSTRUCTIVE UNILATERAL HYDROCEPHALUS.

By Arwyn Roberts, M.B., Ch.B.,
Pathological Department, Runwell Hospital, near Wickford, Essex.

(Received April 19, 1944.)

Cases of unilateral hydrocephalus not due to obstruction of the foramen of Monro are rare, and not more than a dozen accounts of such cases have been published. The *Journal of Mental Science* of July, 1940 (pp. 591–601), contains a paper by R. M. Stewart which gives an excellent review of cases previously published, including two cases of his own.

The main problem in these cases is to find the cause of the condition. Is it weakening of brain substance due to intrauterine disease of encephalitic or other nature, or the result of some temporary blockage of the foramen of Monro due to such a condition as transient ependymal inflammation? Unilateral cortical agenesis with the so-called hydrocephalus *ex vacuo* must also be taken into consideration as a possible aetiological factor.

The following is an account of a case which seemed to have been present at birth and where early syphilis or tuberculosis as a cause can almost certainly be excluded:

A female, aged 45, was at this hospital for four years prior to death from pernicious anaemia. Mentally she was an imbecile, showing gross intellectual defect, disorientation, with outbursts of violence and epileptic fits punctuating a childish and stupid personality. She was never at any school, could not perform the simplest tasks, and needed much nursing supervision. She could speak, but had a limited vocabulary and her replies were mostly monosyllabic. Physically she was of average stature, except for the fact that the right limbs were much shorter than the left. These shortened limbs showed no marked muscle wasting, but were prone to contracture. Neurologically the C.S.F. was normal and Kahn negative, and the reflexes all present and normal, but for general exaggeration. There were no marked sensory changes. The eyes showed nystagmus and divergent squint, and the equal pupils reacted to light and accommodation. The fundi were normal. Radiologically the skull showed no asymmetry, nor any abnormal variations in density. No endocrine gland dysfunction was noted and there was no spina bifida.

Post-mortem examination, besides the lesions of pernicious anaemia, showed the following intracranial changes: Calvarium, no asymmetry. Normal dura. Brain weight, 730 gm. Left hydrocephalic half weighed 183 gm. and was smaller in general dimensions. Right hemisphere no abnormal changes. Left hemisphere flattened convolutions. On section of the brain the left half collapsed. The left lateral ventricle was grossly enlarged and the cerebral cortex around it thinned out except at the poles. The ependyma and choroid plexus showed no abnormal changes, and the foramen of Monro was open and clear. The other ventricles and orifices were normal. The cerebellum was smaller on the left. There were no adhesions anywhere, and no signs to the naked eye of old inflammations. Microscopically the affected cortex showed reduced grey matter, lack of nerve-cells, gross reduction of white matter with glial accentuation. No gross microscopic changes in the right half except for general poor development.

The photograph shows the left hemisphere with its dilated ventricle.

For permission to publish this case I am indebted to Dr. R. Ström-Olsen, the Physician Superintendent, and for the photograph to Mr. T. Hall, M.S.R.

Part II.—Bibliography and Epitome.*

AM. J. ORTHOPSYCHIAT.

VOL. XIV. JANUARY, 1944.

AM. J. PHYSIOL.

VOL. CXXXVII. 1942.

The Relation between the Physical Properties of Electric Currents and their Electronarcotic Action.

Studying the effects of electric currents applied to the temples of dogs, the authors found two types of electronarcosis: one, a narcotic type resembling chemical narcosis, and the other a kinetic type characterized by hyperkinesis and righting reflexes. The type produced appears to depend on the individual animal and not on the type of current used. The electronarcotic effect of direct current is small as compared with that of either pulse or alternating current.

T. G. ANDREWS (Psychol. Abstr.).

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

The Termination of Ascending Trigeminal and Spinal Tracts in the Thalamus of the Cat.

"With oscillographic recording of potentials evoked by peripheral nerve stimulation, the mesencephalic course and thalamic termination of fast-conducting pathways from face and limbs have been studied in the cat. These pathways ascend in and adjacent to the medial lemniscus and terminate in the ventral thalamic nucleus, the limb pathways in its postero-lateral or external division and the trigeminal pathways in its postero-medial or arcuate division."

T. G. ANDREWS (Psychol. Abstr.).

Sexual Behavior in Rats with Lesions in the Anterior Hypothalamus.

"There seemed to be a tendency for damage to the medial half of the anterior hypothalamus to depress sexual activity. . . . Transverse lesions extending from fornix to fornix and lying at various levels from the middle of the optic chiasma to the anterior border of the median eminence are not incompatible with normal sexual behavior. . . . This work, then, neither affirms nor denies the possibility that there may exist in the medial half of the anterior hypothalamus a structure or structures essential for the integration of normal sexual behavior. It does indicate the improbability that such is the case and very definitely limits the course of fibers to and from this hypothetical center."

T. G. ANDREWS (Psychol. Abstr.).

VOL. CXXXVIII. 1943.

Effects on Man of Severe Oxygen Lack.

Schizophrenic patients were subjected to severe anoxia over a period of several minutes either up to or through the point of unconsciousness. The anoxia produced no beneficial effects on these patients nor any lasting harmful effects on the central nervous system. "It should be possible to descend with an opened parachute from 31,000 ft. altitude without oxygen equipment with no ill effects from anoxia."

T. G. ANDREWS (Psychol. Abstr.).

Humoral Intermediation of Nerve Cell Activation in the Central Nervous System.

Central neuro-humoral nerve cell activation was studied on the respiratory act of the dog. Acetylcholine produced hyperactivity of the respiratory center, and the effect varied with the concentration of the substance. "The activity produced was essentially a normal hyperpnea showing the characteristic series of changing and co-ordinated events' . . . during a respiratory cycle." It was concluded that neuro-architectural patterns rather than sensory patterns of impinging impulses exercise the dominant role in nervous integration. The authors propose that their conclusions from studies on the respiratory act are applicable to the central nervous system in general.

T. G. ANDREWS (Psychol. Abstr.).

AM. J. PSYCHIAT.

VOL. C. NOVEMBER, 1943.

Immediate and Follow-up Results of Electroshock Therapy.

Results of the follow-up study of 279 patients who received electroshock therapy indicate that this treatment is very effective in the treatment of involutional melancholia and manic-depressive psychosis. The percentage of recoveries reported for this group is slightly less but comparable with that reported one year ago.

Manic patients do not hold their recovery as well as those who have an agitated depression. There is no evidence to indicate that electroshock treatments may prevent future psychotic attacks, nor that it might interfere with spontaneous clinical recovery.

Electroshock therapy is not effective in the treatment of schizophrenia. It is of doubtful value in the treatment of psychoneuroses.

Traumatic skeletal injuries may be decreased by the use of intocostrin (Squibb). Cardiac and pulmonary complications, vasomotor collapse, spasticity, subconjunctival hemorrhages may develop. Memory changes always occur to some degree during the course of treatment. These memory defects do not seem to be permanent. (Authors' abstr.)

EEGs in Post-traumatic Epilepsy.

EEGs of 86 cases of post-traumatic epilepsy were analysed with particular reference to the localization of abnormal electric discharge. Pre-operative and post-operative studies were made on 32 of these patients on whom operation had been carried out for the surgical removal of an epileptogenic lesion.

Definite electrographic evidence for localization of major epileptiform discharge to a relatively restricted area of one hemisphere was obtained in 90 per cent. of the cases. A relatively superficial focus was found in one area without significant complication by abnormality elsewhere in 69 per cent. of the cases. A combination of random slow waves with random spikes or sharp waves was found to be characteristic of superficial cortical epileptogenic lesions of the cerebral cortex. This is interpreted as representing a local condition of metabolic disturbance, a product of which causes neuronal hyperirritability. These two types of electrographic abnormality are also observed in patients with convulsive seizures which follow shortly after acute head injuries. Generalized electrographic disturbances were present without unilateral localization in 10 per cent. of the cases. Three of these patients showed a diffuse multiple spike and sharp wave disorder, with relatively continuous dysrhythmia of a type suggesting a diffuse lesion of the cortex. Prominent equilateral bisynchronous discharge was found in six cases, in three of which there was found the typical wave and spike form of record commonly considered to be characteristic of "*petit mal*" cryptogenic epilepsy. There are two possible explanations of these cases. Either they are cases of essential epilepsy in which head injury is only incidental to the development of seizures, or the accident produced a lesion at the base of the brain which might be serving as a pacemaker for bilaterally synchronous epileptiform discharge of the two hemispheres. Positive evidence for such a lesion is lacking. Pre-operative electrographic study provided a reasonably accurate guide to the border zone of an objective lesion of the brain in 94 per cent. of the cases in which operation was performed. There was evidence of some former brain injury in the region of electrographic localization in all of these cases.

Complete freedom from seizures or very rare minor attacks resulted from surgical excision of epileptogenic lesions in 71 per cent. of those cases with clear uncomplicated pre-operative spike or sharp wave foci. The percentage of success was less than half this amount in patients whose pre-operative EEG showed more than one spike focus, other areas of delta waves or prominent bisynchronous activity.

From the point of view of surgical therapy the EEG provides strong evidence that the technique of excision which has been used in the past few years is satisfactory. The essential feature of this technique is that gyri should be completely, not partially, removed, and the pial covering of remaining gyri be preserved. The white matter thus left exposed does not seem to give rise to abnormal electrographic record. One month after such a removal, spike and sharp wave activity is not present and there is very little delta activity. These cases show the most favourable clinical course.

Persistence of large delta activity or return of large spike or sharp wave activity usually indicates a bad post-operative prognosis. The EEG cannot be depended on however to predict the developmental course of a potentially epileptogenic lesion of the brain, since regressive as well as progressive lesions are encountered. (Authors' abstr.)

The EEG in Late Post-traumatic Cases.

About one-half (48 per cent.) of late post-traumatic cases have abnormal EEGs. The presence of fracture or unconsciousness does not appreciably alter this percentage. Post-traumatic cases with epilepsy have a higher percentage of abnormal EEGs and post-traumatic cases with headache have a lower percentage of abnormal EEGs than the average. Post-traumatic cases with psychosis have a slightly greater percentage of abnormal EEGs than do those without psychosis.

Late post-traumatic cases suffering primarily from headaches have essentially the same

percentage abnormality of EEGs as non-traumatic cases suffering primarily from headaches. Late post-traumatic cases suffering from psychosis (organic reaction type) have essentially the same percentage abnormality as non-traumatic cases suffering from organic psychosis. Late post-traumatic cases suffering primarily from epilepsy have essentially the same percentage abnormality as non-traumatic cases suffering from epilepsy.

In almost all post-traumatic cases having evidence of focal abnormality by EEG, either (1) the focus corresponded to the area of injury, (2) a fracture or skull deformity was found at the site of the focus, or (3) Jacksonian seizures were present involving the side opposite the focus.

(Author's abstr.)

JANUARY, 1944.

Results of Hospital Treatment of Alcoholism.

1. A study has been made of 100 men suffering from alcoholism, admitted to the New York Hospital, Westchester Division, between 1934 and 1940.

2. A review of the family background has shown the common occurrence of excessive drinking in the relatives, the predominance of small families, and an indulgent, pampering type of mother in 59 instances.

3. The drinking usually began at an early age, and continued for an average of 15 years before serious treatment was undertaken.

4. Follow-up studies of these 100 men three to eight years after discharge revealed that 24 were recovered and 19 were managing better, making a total of 43 who had been definitely benefited by treatment.

(Authors' abstr.)

Intellectual Impairment in Head Injuries.

1. This investigation is concerned with the frequency and nature of intellectual impairment in head injuries.

2. The methods for evaluation of defects are discussed with special reference to the two criteria used in this study: comparison of performance with estimated intelligence, and improvement on repeated examinations.

3. The following tests measured the impairment best: 100–7 test, pictorial absurdities, hole-in-the-board test, pictorial discrimination, naming of colors, and reading.

4. The mental functions affected are primarily: speed, judgment, and ability to keep up a sustained effort.

5. About one-half of all subjects suffering from head injury show slight intellectual defects. These become less marked with increasing remoteness from the time of the injury. If the impairment is reversible, the duration is usually a matter of less than three months.

6. The impairment seems to be related to the severity of the brain damage. The more serious the intellectual defect the higher is the incidence of abnormal neurological signs.

(Author's abstr.)

AM. J. PSYCHOL.

VOL. LVI. 1943.

Changes in the Speech Pattern under Emotiona Tension.

Fifty-two inexperienced subjects were brought before the microphone, thinking they were broadcasting, and oscillographic records were made of their utterances. The amount of fear present was determined from a questionnaire. Controls were later obtained. For comparison 3 trained actors made records simulating fear, and 10 subjects said "ah" into the microphone while experiencing an emotional stimulus. It was found that 46 cases showed a higher, 19 a lower pitch in the fear than in the control situation. The average hypha (physiological syllable) length was increased in 32 and decreased in 23 cases; 32 subjects had pulsation rates (fast vibrato) on the experimental record, while only 7 had it on the control. It is concluded "that a clear picture of the way speech carries emotional components cannot be drawn from a single attribute of speech (such as pitch or time), or from the study of a single 'step' in the scale of speech-specificity (melody, rhythm, accent, vowel, consonant). . . . It can be said, however, . . . that under 'tension' as compared with the 'normal' there are more individuals whose frequency-rate is higher, more whose hypha-time and pause-time are longer, more who show the presence of high-speed pulsations, and a few more who attack and release the hypha in a hard rather than an easy fashion." D. E. JOHANNSEN (Psychol. Abstr.).

Retroactive Inhibition and the Motivation of Learning.

"Evidence has been presented to show that the facts of retention in their relation to motivation may be subsumed under the general theory of forgetting as a function of 'massing' within the trace-field. A hypothesis outlined by Koffka has been restated and generalized as follows: Increased ego-involvement in any learning stiuation has the effect of maintaining for a longer time a high degree of organization in the resulting trace-systems, with the consequence that similar traces have a reduced destructive influence and retro-active inhibition is thereby diminished. Experiments comparing (1) intentional and incidental learning, (2) interrupted and completed tasks, and (3) memorization in hypnotic and waking states have been discussed as support for the hypothesis. A discussion of weaknesses and gaps in the theory and in our knowledge of these effects is appended." D. E. JOHANNSEN (Psychol. Abstr.).

On the Specialization of Carelessness.

Ninety-two subjects were asked to reproduce lines 100–110 mm. in length and to cancel out 50 capital A's, then S's, B's and K's, from a sheet containing 700 printed letters. The average deviation from the correct length had a mode at 2·0–2·4 mm.; the median number of omitted letters was 11. The r between the scores was less than ·30. Aside from the factor of visual discrimination, the individual differences in scores represent carelessness; the relationships found indicate that carelessness has great specificity. D. E. JOHANNSEN (Psychol. Abstr.).

ARCH. INT. MED.

ARCH. NEUROL. PSYCHIAT.

ILLINOIS PSYCHIATRIC SOCIETY.

NEW YORK ACADEMY OF MEDICINE, SECTION OF NEUROLOGY AND PSYCHIATRY AND NEW YORK NEUROLOGICAL SOCIETY.

PHILADELPHIA NEUROLOGICAL SOCIETY AND PHILADELPHIA PSYCHIATRIC SOCIETY.

Acute Arrest of Cerebral Circulation in Man.

A new method, using the KRA apparatus, has been devised to produce complete arrest of the cerebral circulation in man.

Acute arrest of the cerebral circulation in normal young men results in fixation of the eyes, tingling, constriction of the visual fields, loss of consciousness and, immediately after restoration of blood-flow, a brief, mild tonic and clonic seizure.

The average time from arrest of cerebral circulation tol oss of consciousness in normal young men is six and eight-tenths seconds. This coincides with the sudden appearance of the delta wave in the electroencephalogram. One second before loss of consciousness one observes fixation of the eyes in the midline.

The time for recovery of the light-buzzer response depends on personality factors, and does not correlate with sensitivity to acute anoxia. The time of recovery appears to be decreased by pre-engorgement and administration of large doses of the B vitamins.

Arrest of the circulation to the human brain for one hundred seconds may be followed by rapid recovery of consciousness and no objective evidence of injury. The corneal reflex may disappear in less than ten seconds. The abdominal reflex disappears, and the Rossolimo and Hoffmann reflexes often become positive during acute cerebral anoxia, while the Babinski reflex is not obtained.

Considerable individual variation has been noted in sensitivity of normal young men to acute arrest of circulation to the brain. This variation is apparently due to differences in cerebral metabolism in different persons. The resistance to acute anoxia is fairly constant for the same person at different times.

Calculations based on this investigation give figures for oxygen utilization of the human brain of 1·56 c.c. per second, or 4,140 cu. mm. per gm. per hour. This corresponds closely to figures for total brain metabolism reported for the dog and cat. To supply the brain with oxygen, the blood-flow through that organ must average 14,000 c.c. per minute, or about 100 c.c. per 100 gm. of brain weight per minute. At rest the brain receives about one-third of the output of the left ventricle per minute, although it represents only 2 per cent. of the body weight.

(Authors' abstr.)

Changes in the Electroencephalogram Following Metrazol Shock Therapy: A Quantitative Study.

Twenty depressed patients subjected to metrazol shock therapy were studied electroencephalographically. Eleven were studied before and after treatment, nine after treatment only.

The following observations were made:

1. No significant group variation in the alpha index followed metrazol shock therapy, although there were striking individual changes.

2. There was significant variation in slow activity after such therapy.

3. This variation was made manifest as an increase in activity of less than six per second frequency in the motor and frontal areas.

4. There was evidence that the amount of slow activity following therapy was conditioned by the amount of such activity preceding therapy.

5. There was individual susceptibility to change in slow wave activity.

(Authors' abstr.)

Changes in the Electroencephalogram Following Insulin Shock Therapy: A Quantitative Study.
For ten patients with schizophrenia electroencephalographic records were obtained before and after insulin shock therapy. Eight of the ten patients exhibited an increase in the alpha index, which was more prominent in the frontal areas. Averages for the groups showed no striking deviations in slow activity. The increase in alpha activity may be due to slowing of pre-shock faster than alpha activity. (Authors' abstr.)

Cerebral Arteriovenous Oxygen Difference: (1) *Effect of Age and Mental Deficiency.*
The cerebral arteriovenous oxygen differences for undifferentiated mentally defective persons reveal a significant and progressive increase during growth. The values are 4.7 volumes per cent. for the ages of 6 to 9 years, 5·1 volumes per cent. for the ages of 10 to 14 years, 5·9 volumes per cent. for the ages of 15 to 19 years, and 6·6 volumes per cent. for the ages of 20 to 55 years. For the newborn the cerebral arteriovenous oxygen difference averages 8·6 volumes per cent.
The cerebral arteriovenous oxygen differences for undifferentiated mentally defective persons are the same for the corresponding age-groups whether the intelligence quotients of the subjects are from 8 to 49 or 50 to 88.
The average cerebral arteriovenous oxygen difference for 45 undifferentiated mentally defective persons from 20 to 55 years of age is 6·6 volumes per cent., a value not significantly different from that for persons with greater intelligence. Since there is no evidence to indicate that the cerebral blood-flow in these subjects was changed from the normal, it is concluded that the cerebral metabolic rate of undifferentiated mentally defective persons from 20 to 55 years of age is not changed from the normal, and that their mental deficiency is not caused by an impaired cerebral metabolic exchange.
It is suggested that the cerebral arteriovenous oxygen differences for the undifferentiated mentally defective persons of the five age-groups from 6 to 55 years are similar to those for persons with higher intelligence quotients.
The high average cerebral arteriovenous oxygen difference for infants less than two weeks old may be due to a slow cerebral blood-flow, and may occur despite a low cerebral metabolic rate. (Authors' abstr.)

Diffuse Leukoencephalopathy Without Sclerosis: Clinicopathologic Study of a New Form, with Comment on Various Types of So-called Diffuse Sclerosis and Schilder's Disease.
A case of ophthalmoplegia characterized by dissociation of all conjugate movements of the eyes except convergence is presented. In cases of this disorder previously described the dissociated movements were limited to the lateral plane.
The lesion was undoubtedly a congenital weakness of the fibers of the medial longitudinal fasciculus co-ordinating the nuclei of the third, fourth and sixth cranial nerves into the function of binocular vision. The phylogenetically older functions of convergence and the vestibulo-oculomotor connections were not affected. (Authors' abstr.)

DECEMBER.

Chicago Neurological Society.

New York Academy of Medicine, Section of Neurology and Psychiatry, and New York Neurological Society.

Chemotherapy of Intracranial Infections. II: Clinical and Pathologic Effects of Intracranial Introduction of Sulfanilamide, Sulfathiazole and Sulfadiazine in Normal Dogs.
In this paper 115 experiments are reported in which sulfanilamide, sulfathiazole or sulfadiazine was implanted intracranially by various methods and in various amounts.

Important clinical results were the production of convulsions by sulfathiazole (when placed on the intact cerebral cortex) and of pleocytosis by all three of the drugs.

Significant pathologic effects were: (1) Immediate acute pachymeningitis and leptomeningitis, with corresponding subacute or chronic inflammation in the later stages; (2) marked fibroplasia in the dura; (3) conspicuous gliosis in the cortex; and (4) varying degrees of neuronal degeneration, proliferation of oligodendrogliocytes and metamorphosis of microglia cells.

All reactions were least extensive when sulfanilamide was employed, and increased with all the drugs when the dose was increased.

These experiments do not indicate that the effects of sulfanilamide and sulfadiazine are sufficiently harmful to contraindicate their critical use in the therapy of intracranial infections. They suggest that sulfathiazole should never be employed in a cranial wound in which there is an opening in the dura. (Authors' abstr.)

Electric Convulsive Therapy, with Emphasis on Importance of Adequate Treatment.

A review of electric convulsive therapy is presented on the basis of experience with 1,500 patients treated in two hospitals with different types of material. The importance of adequate treatment is emphasized, and several technical suggestions are given.

In the manic-depressive psychoses, manic states need more intense treatment than depressive states. Involutional psychosis of the paranoid type shows a less favorable response than does involutional depression.

Stress is placed on the efficacy of electric convulsive therapy in cases of acute schizophrenia when a sufficient number of convulsions is administered; discontinuation of treatment after the usually early clinical improvement leads almost invariably to relapse, and is the most important reason for failure of this method in treatment of schizophrenia.

The results of electric convulsive therapy are less satisfactory for the psycho-neuroses than for the psychoses.

No fatalities occurred in this material. Complications were rare and can largely be prevented.

Electroencephalographic changes and confusional states should not lead to discontinuation of treatment until an adequate number of convulsions have been given. Physical diseases may not be contraindications to therapy if they are aggravated by the mental condition.

(Author's abstr.)

Combined Convulsive Therapy and Psychotherapy of the Neuroses.

Twenty neurotic patients in the New Hampshire State Hospital who received a combination of convulsive treatment and active psychotherapy have been studied. This study was undertaken primarily to evolve a practical procedure of treatment rather than to make a statistical comparison of different types of treatment.

The usual procedure of choice was first analytic psychotherapy, followed by four to six electric shock treatments and, finally, by efforts at re-education.

In 50 per cent. of patients the disease was considered to be in remission; in 45 per cent. the condition was much improved or improved, and in 5 per cent. it was questionably improved.

The period of hospitalization for treatment of the neuroses is definitely shortened.

Follow-up studies indicated a satisfactory adjustment and gain in inner resources in the vast majority of our patients. All were able to leave the hospital.

The conception of the healing mechanism is as follows: Shock therapy prepares the ground for psychotherapy by improving the affective tone, fostering active co-operation and tending to overcome the "repetition compulsion." Psychotherapy permits the patient to gain understanding and inner fortitude, as a guard against relapse. (Authors' abstr.)

Perceptual-Motor Patterns Following Bilateral Prefrontal Lobotomy.

The experimental work carried out on perceptual-motor processes seems to indicate that in this particular series of cases bilateral prefrontal lobotomy did not have an appreciable effect on the elementary motor integrative functions. In none of the patients was post-operative disturbance noted when there had been no pre-operative disturbance. This situation held for all of the tests used in the evaluation of motor processes. It is true, of course, that there were instances in which pre-operative disturbance disappeared after the lobotomy. The author attributes this increased motor efficiency to a reflection of increased total adjustment on the segmental, or partial, patterns of behavior. He does not believe that there had been reorganization on a primarily motor level, or that motor integration in the brain had been disturbed as a result of interference with intrafrontal connections or frontothalamopontile connections. While it must be admitted that animal studies have shown a definite relation between the frontal poles and motor function, the work with human material has not demonstrated the extreme motor dysfunction noted in lobectomized animals. This seeming contradiction, he believes, is to be explained in terms of differences in the cytoarchitectonic organization of the human brain and that of the lower animals. The author has found in his work with lobotomized patients that while automatic acts, restlessness, synkinesis, gestalt dysfunction, apraxis and agnosis are sometimes observed both before and after operation, and that while these signs occasionally disappear after the neurosurgical procedure, the essential factor is the destruction of psychotic attitudes rather than altered neurodynamic organization. Thus, while the operative group showed both pre-operative and post-operative motor irregularities, and while the post-operative

irregularities of patients who showed improvement were less pronounced than those displayed in the pre-operative period, the pattern of motor dysfunction approximated that of psychotic patients in general. As clinical improvement became apparent, improved motor integration occurred, although there was no evidence of motor disturbances related specifically to frontal lobotomy. (Author's abstr.)

Use of Insulin as Sedation Therapy: Control of Basic Anxiety in the Psychoses.

Adminstration of insulin in subcoma doses provides an effective method of sedation. Its specific action seems to be in alleviation of anxiety. With relief of anxiety, the psychotic manifestations sometimes rapidly disappear. The method is entirely safe, and is far superior to that achieved by chemical sedation. Combined with active psychotherapy, it has proved of great value in the treatment of a series of difficult patients. (Author's abstr.)

VOL. LI. JANUARY, 1944.

BOSTON SOCIETY OF PSYCHIATRY AND NEUROLOGY.

PHILADELPHIA NEUROLOGICAL SOCIETY.

Atrophy of Basal Ganglia in Pick's Disease: A Clinicopathologic Study.

In a clinicopathologic study of a case of Pick's disease extensive bilateral involvement of the caudate nucleus, the substantia nigra, the pallidum and the subthalamic nucleus was observed. (Author's abstr.)

Cerebral Arteriovenous Oxygen Differences. II. Mental Deficiency.

The cerebral arteriovenous oxygen differences are high in patients with amaurotic familial idiocy, and normal for those with microcephaly and hydrocephalus not in the terminal stages.

Above the age of 20 years the cerebral arteriovenous oxygen difference is lower for patients with mongolism, cretinism and phenylpyruvic oligophrenia than for persons with undifferentiated mental deficiency.

In persons with mongolism the cerebral arteriovenous oxygen difference ceases increasing ten years earlier than in those with undifferentiated mental deficiency.

It is suggested that cerebral metabolism is reduced in patients with mongolism, cretinism, phenylpyruvic oligophrenia, advanced hydrocephalus, microcephaly and amaurotic familial idiocy. (Authors' abst.)

Cerebral Cortex of a Man with Senile Dementia Believed to be 107 Years Old.

1. The cytoarchitecture in this very old brain was well preserved and revealed the well-known regional variations.
2. There were definite pyramidization, granularization and spindlization.
3. The gross and histopathologic changes considered as characteristic of the senile brain were present to only a moderate degree.
4. Processes of repair and regeneration were detectable. (Authors' abstr.)

FEBRUARY.

Chicago Neurological Society.

Philadelphia Psychiatric Society.

Illinois Psychiatric Society.

A Simple Method of Determining Frequency Spectrums in the Electroencephalogram: Observations on Effects of Physiologic Variations in Dextrose, Oxygen, Posture and Acid-base Balance on the Normal Electroencephalogram.

A simple method of determination of the average frequency distribution of the electroencephalogram, which is presented here, yields a spectrum of the average number of waves per second and is highly accurate for regular records, although progressively less accurate with records of decreasing regularity.

After intravenous infusion of dextrose there was a shift toward faster frequencies (up to 12 per second) with rising levels of dextrose in the blood, and a shift toward slower frequencies with falling levels of dextrose. The amount of low voltage fast activity, however, was not influenced by the dextrose level in the blood.

Inhalation of 100 per cent. oxygen for five minutes or longer resulted in a shift toward faster frequencies (up to 12 per second).

Change from the recumbent to the erect posture had no effect on the cortical frequency spectrum unless orthostatic hypotension developed.

The decrease in frequency of the brain-waves during hyperventilation was greatest with low dextrose levels in the blood and least with high dextrose levels in the blood, in spite of comparable alterations in hydrogen ion concentration, carbon dioxide tension, carbon dioxide content and base bicarbonate concentration of the arterial blood.

Hyperventilation produced much greater slowing when the patient was in the erect position than when he was in the recumbent position. Tachycardia and decrease in pulse pressure were also greater when the subject was in the erect position than when he was in the recumbent position during hyperventilation. (Authors' abstr.)

Biopsies of the Brain of Schizophrenic Patients and Experimental Animals.

Histologic examination of biopsy specimens from the prefrontal cortex of patients with chronic schizophrenia revealed degenerative changes of the ganglion cells and progressive and regressive reactions of the glia and blood vessels, such as are commonly seen in cases of chronic intoxications and metabolic disorders. Study of control material obtained from non-schizophrenic human beings and experimental animals proved that the changes were not attributable to the ether narcosis during which the material had been obtained. (Authors' abstr.)

Relation of Narcolepsy to the Epilepsies: A Clinical Electroencephalographic Study.

In a majority, 8 out of 10, of this series of cases of narcolepsy wave forms similar to those most commonly observed with the epilepsies were present.

Because of the unanimous objective electroencephalographic evidence that the primary component of the narcoleptic syndrome is a sleep phenomenon, it appears, despite the antiquity of the term narcolepsy, that the syndrome should be designated by the name of hypnolepsy.

Since the electroencephalographic abnormalities observed during the inter-seizure phase of the hypnoleptic (narcoleptic) syndrome appear qualitatively similar to those associated with the epilepsies, it appears that Wilson's concept that the narcoleptic (hypnoleptic) syndrome is a member of the family of epilepsies is confirmed. A more precise statement of this relationship,

based on electroencephalographic evidence, is that the clinical manifestations both in the epilepsies and in hypnolepsy are often associated with objective evidence of disturbances in the physiology of the brain. (Authors' abstr.)

Acetylcholine Treatment of Schizophrenia.

With 8 of 11 schizophrenic patients treated with convulsant doses of acetylcholine no general therapeutic benefit was obtained. In one patient there was slight, and in another moderate, improvement. One patient's condition underwent a dramatic remission after a therapeutic episode in which he was pulseless for such long periods that he was considered probably dead. On the basis of the available literature it is considered that prolonged cardio-respiratory collapse occurred, as a consequence of which changes in the brain were produced.

The therapeutic results do not justify the continued use of acetylcholine in this manner, particularly since the margin of safety of the drug appears to be extremely slight.

(Authors' abstr.)

Effect of Serum on Survival Time of Brain Tissue and Revival of Cerebral Oxidation.

The oxygen uptake of minced brain in plain Krebs-Ringer phosphate solution buffered at a pH of 7.38 was approximately 0·85 c.mm. per mgm. of tissue (wet weight) for the first hour, with a flattening off of the oxidation curve in approximately six hours. In a similar suspension medium of buffered Krebs-Ringer phosphate solution containing 200 mgm. of dextrose per 100 c.c. the oxygen uptake was 1·11 c.mm. per mgm. of tissue for the first hour, with an abrupt flattening of the oxidation curve about eight hours afterward. This abrupt flattening did not occur if a small amount of serum was present in the immersion fluid, but oxidation continued at a practically constant rate for the duration of the experiment.

The cessation of oxidative activity of minced brain tissue was not due to lack of substrate, since determinations of the dextrose content of the immersion fluid revealed a substantial excess of dextrose still present after oxidations had practically ceased.

The addition of dextrose to a dextrose-free suspension medium did not revive oxidation in the brain after a period of six hours.

The cessation of oxidation in these experiments could not be attributed to the production of any inhibiting substance, since oxidation was not revived after the tissues had been washed in isotonic solution of three chlorides (U. S. P.), and placed in a fresh suspension medium.

There was a significant support of flagging oxidation on the addition of serum to a dextrose-free medium at the end of six hours. The effect was not enhanced by the combination with dextrose or by the use of whole blood.

The most likely explanation of the phenomenon appears to be the presence of some essentia of the oxidative enzyme system in the serum or the restoration of normal osmotic relations by the large serum protein molecule. (Author's abstr.)

ARCH. PATH.

VOL. XXXVI. DECEMBER, 1943.

ARCH. PSYCHOL., GENÈVE.

VOL. XXVIII. 1941.

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VOL. XL. 1943.

Effects of Certain Forms of Emotion on the Normal Electroencephalogram.

In general, the changes in the EEG associated with the forms of emotional excitement utilized in the present investigation appear to be within the limits of normal electrocortical activity. When increases of the slower potentials were observed, only the lowest amplitude slow waves, which are not easily differentiated from flat record, were involved. None of the changes appear to be of such nature as to affect the clinical impression obtained by inspection

of the record and comparison with clinical standards, providing sufficient care is taken to identify and eliminate from consideration a number of physiological potentials which are not electro-encephalographic phenomena. Certain extraneous effects which often increase under emotional excitement, such as potentials arising from rapid fluttering of the eyelids and occasionally from a special circulatory change, can create a false impression of abnormality if they are not correctly identified.

In a quantitative analysis of brain potentials, isolated from other physiological potentials, the following results were obtained from the four most strongly reactive members of a group of ten subjects. The delta index did not increase during emotional excitement. A slight reduction of the rhythmic or serial components of the electroencephalogram, attended by an increase in flat record, was commonly observed. A limited amount of simultaneously recorded data from two cortical areas (one subject) suggests that some of the effects of emotion upon the EEG, especially the depression of rhythmic activity and the increase of flat record, may become rather widely generalized, indicating that effective emotional stimulation can influence the function of the greater part of the cortex. But more commonly a specific and more localized effect was observed (from three of the four subjects whose data were quantitatively analysed). The effect consisted of a depression of the fast activity or beta rhythm from the fronto-motor region primarily; and the reduction was sometimes observed in the absence of depression of the occipital alpha rhythm. This result has not been previously reported as an effect of sustained emotional excitement, possibly because of the focusing of attention upon the occipital region in the earlier investigations.

It is felt that the results of the present experiment indicate that the cortical components of certain emotional reactions are reflected in the normal electroencephalogram, and that the specific area of cortical representation of the autonomic nervous system which Fulton, Kennard and Watts have charted (premotor area) is involved in a specific electroencephalographic response. Suppression of the beta rhythm has previously been reported in association with startle stimuli and with unexpected tactual stimulation. The present data seem consistent with such observations in so far as all of these responses may be related to excitation centers influencing the sympathetic division of the autonomic nervous system.

Suppression of the precentral beta rhythm during excitation involving the autonomic nervous system suggests that it may be possible to extend Jasper's hypothesis of brain rhythms in terms of the level of a "cortical excitatory state" beyond his interpretation of variations of the occipital alpha rhythm to include the precentral fast potentials. For, in the precentral and frontal regions, or in a circumscribed area within these regions, an analogous mechanism may exist; above a critical level of the functional activity of certain cortical cells brain potentials of the faster than alpha frequencies may show less rhythmic characteristics, or may become significantly reduced in their incidence and amplitude. Further research directed towards more exact differentiation of the cortical areas involved in this response and toward a determination of the generality of the response is indicated. (Author's abstr.)

AUSTR. J. PSYCHOL. PHIL.

VOL. XX. 1942.

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Afferent Areas in the Cerebellum Connected with the Limbs.

(1) Afferent discharges reaching the cerebellum by the spino- and ponto-cerebellar pathways can be recorded with a wire electrode at a depth of about 1·5 mm. from the surface.

(2) The areas receiving these discharges agree in general with those determined by Dow using a slightly different technique, but with the present method it is possible to make a detailed map of the regions connected with different parts of the limbs and body.

(3) In the cat and monkey spino-cerebellar discharges from the hind-limb arrive in the lobulus centralis on the same side. Discharges from the fore-limb arrive behind them in the culmen, and in some animals discharges from the vibrissae of the snout are found still further back in the lobulus simplex. This arrangement is the reverse of that described by Connor for the efferent connections of the cerebellum as the result of ablation experiments. The afferent areas for the different limb segments are in the order hind-foot, leg, hip, shoulder, fore-arm, fore-foot.

(4) Records of the afferent discharge in single units differ very little from records made from peripheral nerve-fibres. Some discharges come from rapidly adapting tactile receptors, but the commonest are from pressure receptors in the feet and receptors in joints and muscles. Dorsiflexion at wrist or ankle combined with pressure on the palmar or plantar surface is a most

effective stimulus. A single afferent unit in the cerebellum may be connected with receptors as far apart as toe and heel.

(5) Ponto-cerebellar discharges to the lobulus centralis, culmen and lobulus simplex are derived from the hind-limb, fore-limb and face regions of the motor cortex. The receiving areas overlap those for the spino-cerebellar discharges, extending further out laterally. Discharges from the cerebrum can be detected in other parts of the cerebellum (e.g. the ansiform lobules), but their exact origin has not been traced.

(6) The intrinsic activity of the cerebellar cortex is shown by small potential waves of high frequency (150 to 250 per second). These are increased in size and frequency by afferent discharges. The increase is greatest in the region of arrival of the discharge, but there is some spread of the effect, so that a stimulus to the hind-foot may cause a slight increase in the activity of the fore-foot area (culmen), as well as a much larger increase in the lobulus centralis.

(7) In two dogs and one goat the localization of afferent discharges in the cerebellum agreed with that found in the cat and monkey. Thus the difference in the efferent arrangement found by Conner cannot be due merely to a species difference, and further work must be done before conclusions can be drawn as to the neural mechanism of the cerebellar cortex. In general, however, the response of the cerebellar neurones to afferent impulses is not very different, except in time relations, from that of the neurones of the cerebral cortex. (Author's abstr.)

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VOL. XXXIV. JANUARY, 1944.

BULL. CANAD. PSYCHOL. ASSOC.

VOL. III. 1943.

Rorschach Scores of Parachute Troopers in Training.

A Rorschach group test was given to 65 volunteers accepted for parachute training, and 35 who had failed to complete such training for reasons presumably related to personality factors. The second group differed significantly from the first in having a lower mean number of responses, a greater variation in number of responses per slide, and a greater number of failures to respond. These characteristics are typical of unstable and neurotic subjects. It is necessary to conclude, however, that " the group Rorschach, by itself, cannot provide a criterion for prediction of the remaining paratroopers unlikely to complete their course when these have already been selected by personal interview." F. W. FINGER (Psychol. Abstr.).

BULL. LOS ANGELES NEUR. SOC.

VOL. VIII. 1943.

BULL. MENNINGER CLIN.

VOL. VII. 1943.

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VOL. XXXVIII. 1943.

J. AMER. MED. ASS.

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Subdural Hematoma and Effusion as a Result of Blast Injuries.

In spite of the usually negative neurologic findings, subdural hematoma and effusion can frequently be diagnosed by psychiatric examination and psychological testing. In contrast to

psychoneurotic patients, subdural patients exhibit " dull " facial expressions and lack of " push " even with reference to their complaints. On psychological tests, slow response times, poor concentration, and rage reactions when confronted with failure point to the organic condition. The Rorschach responses show lowered productivity, popular, " easy," whole responses, little attention to detail and no particular color shock. The Shipley-Hartford Retreat Test is recommended as effective in diagnosing subdural hematoma or effusion, particularly when the frontal lobe is involved. D. A. GRANT (Psychol. Abstr.).

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CXXIV. 1943.

J. AM. SOC. PSYCHIC RES.

VOL. XXXVII. 1943.

J. ANAT.

VOL. LXXVII. 1944.

J. APP. PSYCHOL.

VOL. XXVI. 1942.

A Multiphasic Personality Schedule (Minnesota). IV: Psychasthenia.

The derivation of a scale is reported for measuring psychasthenia, a condition involving compulsions, obsessions, phobias, vacillation, and excessive worry. 504 scale items were applied to large groups of normal adults and college students and to 20 psychiatric patients selected as cases of psychasthenia. The scale selected was further refined on the basis of correlation of items with total score for 100 normal adults and 100 psychiatric cases. The final scale, composed of 48 items, differentiates well between normal adults and the criterion group of 20 psychasthenic cases, and also between normal adults and 50 psychiatric cases with symptoms of obsessions or compulsions. For normal adults there are small differences in scores between age groups and slightly larger differences between the sexes. Test-retest reliability is ·79; split half reliability is ·91–·94. The scale correlated ·06 and ·28 with the authors' test for hypochondriasis for 100 normal persons and 100 miscellaneous psychiatric cases respectively, and ·44 and ·69 with their test for depression for the same groups. The scale with its scoring key is included in the article. G. R. THORNTON (Psychol. Abstr.).

The Effects of Benzedrine Sulphate and Caffeine Citrate on the Efficiency of College Students.

An early experiment failed to show significant effects of benzedrine sulphate on group means of reading, multiplying, and analogies scores. Subjective reports from both drugged and non-drugged subjects indicated widely varying subjective effects and the influence of suggestion. 129 students were divided into three groups equated for intelligence and sex. At the beginning of a two-hour period one group was given 15 mgm. of benzedrine sulphate, another group 5 gr. of caffeine citrate, and a third a sugar capsule. All were tested during the two hours on three 10-second trials in tapping, a reading test, a vocabulary test, and an analogies test. Among the conclusions reached are the following: "The experimental evidence to date concerning the effect of benzedrine sulphate and caffeine citrate on human efficiency is conflicting." "When college students are unaware of the contents of the pills administered and when they are told that each pill should be stimulating, the non-drugged group seems to improve practically as much as the benzedrine and the caffeine groups." "Reported clearness of thinking and rapidity of work are not substantiated by the group results." G. R. THORNTON (Psychol. Abstr.)

J. COMP. NEUR.

VOL. LXXIX. 1943.

J. COMP. PSYCHOL.

VOL. XXXVI. DECEMBER, 1943.

J. CONSULT. PSYCHOL.

VOL. VII. 1943.

J. EDUC. PSYCHOL.

J. EXP. PSYCHOL.

DECEMBER.

Problem Solution by Monkeys following Bilateral Removal of the Prefrontal Areas: Responses to Stimuli having Multiple Sign Values.

The scores of the two prefrontal monkeys on the various multiple sign problems described in the paper are consistently inferior to those obtained earlier on four normal rhesus monkeys. These data suggest that the extirpation impaired the ability of the operates to make varying and antagonistic responses to a single stimulus depending upon the particular patterning of the total situation. Since the problem was completed in less than two years after the operation, caution should be exercised in assuming that the operation produced permanent loss. It is entirely possible that two years is too short a time to permit complete post-operative recovery. Even though some deficit appears to exist, the residual abilities of the operated Ss are striking, and represent achievements never previously reported for monkeys following excision of the frontal areas and seldom attained by any subhuman animals. In the combined matching and non-matching tests the monkeys solved third-order generalizations (2) or third-order contingency problems—a creditable performance for any infrahuman organism. The data of this paper indicate that a considerable degree of intellectual sparing followed even the radical operation reported. Similar general results have been described for human patients by Hebb and Penfield and by Nichols and Hunt. In both studies the patients were given over a year to recover from the operations.

The ability of animals, human and subhuman, normal and pathological, on any test, is as dependent upon experimental procedure as it is upon any difficulty intrinsic to the task itself.

The success of the monkeys on the complicated tests of this paper is in large part a result of the nature of the procedure and the long period of adaptation to the test situation. The methods used in this experiment, in their own way, give instructions by the specific cues or signs standing for more abstract generalizations. The use of stepwise procedures may simplify the apparent complexity of the final tasks. To begin with, a single stimulus elicited few differential responses, and additional sign-values were not added until the earlier ones had been thoroughly established.

The importance of method in making possible the solution of complex problems by prefrontal animals is suggested in the report of Nichols and Hunt on the effects of partial bilateral frontal lobectomy on a human patient. Strong evidence was advanced to show that the Ss' performance was markedly better when given specific instructions by the experimenters as to method of approach to problems, or when told to look for new systems of attack upon the problems. The inability of human Ss, following serious brain injury, to shift pre-established sets and to utilize new methods of approach in the solution of tasks has been emphasized by Goldstein.

It is more than possible that the best way to illustrate the difference between normal and pathological animals, both human and subhuman, is by the use of relatively ineffective test techniques (from a pedagogical point of view).

Whenever animals or people are thrust directly into a new situation without adequate preparation, divergence in abilities is exaggerated. Learning to read, learning how to do long division, learning to solve algebraical equations are more difficult tasks than subsequent reading, doing more long division and solving further algebraical equations. The pedagogically good training technique seeks to decrease the difficulty offered by the original learning of a particular skill and thus reduce individual variation in these performances.

It seems certain that serious brain injury reduces general learning ability. The ability to find new and appropriate ways to learn new problems appears to suffer particularly. The answer to this may lie in the fact that learning how to learn is an extremely difficult aspect of the process of acquisition. If this is true, teaching methods become of extreme importance, and analysis of procedures is as important as analysis of problems in the determination of the effects of cortical lesions. (Author's abstr.)

J. GEN. PSYCHOL.

VOL. LXII. 1943.

Pharmacological Shock Therapy as a Psychobiological Problem.

The writers review the literature on insulin and metrazol therapy in mental diseases with emphasis on the relation of the physiological changes to the overlying behavioral picture. They point out that, although the biochemical and physiological mechanisms involved in insulin shock and metrazol convulsions are essentially different, the behavioral modifications are similar; furthermore, theories previously advanced to account for this equivalence of behavior are suggestive but inadequate. They present a tentative Gestalt picture of the psychological changes resulting from shock therapy and suggest that two stages are involved: (1) a disintegration of the "out of step" behavioral field, which is followed by (2) a regrowth of the mind. During the latter stage two opposing sets of forces determine the extent of the cure. The destruction of the behavioral environment is not quite complete and the old behavioral barrier may be reconstructed, and the nearness to complete ego disintegration forces the ego to form stabilizing relations with any developing behavioral object. The psychotherapeutic implication which follows this hypothesis is that the clinician should establish rapport during the early stages of the behavioral rearticulation. H. H. Nowlis (Psychol. abstr.)

J. NEUROL. PSYCHIAT.

VOL. VI. 1943.

J. NEUROL. PSYCHOL., LPZ.

VOL. XLIX. 1940.

Electro-encephalographic Investigations on the So-called Alpha Waves in the Rabbit.

The potentials from different areas of the cortex of rabbits under light dial anaesthesia were recorded. The curves showed essentially aperiodic, large, and slow potential waves of about 1·5–3 per second. These showed no characteristic details peculiar to the architectonic areas investigated (area praecentralis granularis and area postcentralis). Sufficiently strong stimulation of the animals (e.g. pinching until a reflex twitch resulted) caused the slow waves to disappear for some time and produced characteristic potential curves in the two cortical areas. These potential curves bear suggestive resemblance to the alpha waves of the human electroencephalogram, but one can assert no more than the apparent resemblance until the exact nature of the alpha waves in particular and cortical activity in general is known.

L. H. Beck (Psychol. Abstr.).

J. NEUROPATH. EX. NEUROL.

Pathologic Changes in the Brain after Electric Shock: An Experimental Study on Dogs.

1. Three dogs were subjected to electric shock according to the technique used in human subjects.

2. The shock dosage and the frequency of the convulsions varied with each animal.

3. Pathologic alterations in the brain were minimal: a single perivascular hemorrhage and capillary thrombi in one animal and shrinkage and ischemia of ganglion cells near the site of the electrodes in the remaining two animals.

4. There was no direct correlation between the amount of current used and the changes noted in the brain.

5. It seems that on the basis of the findings here recorded therapeutic electric shock is not contra-indicated in the treatment of psychoses. (Author's abstr.)

J. NEUROPHYSIOL.

Acetylcholine Level of Rat Cerebral Cortex under Conditions of Anoxia and Hypoglycemia.

1. Several methods of extraction and assay of free and total ACh in the cerebral cortex of the normal rat are compared.

2. Subjecting rats to low atmospheric pressure for 1 to 2 hours is shown to decrease the level of free or total ACh in the cortex by approximately one-third to one-half.

3. Administration of prostigmine before low pressure treatment prevents a decrease in free ACh in the cortex.

4. Insulin hypoglycemia results in a greater decrease in free ACh than that produced by the low-pressure treatment.

5. It is suggested that the decline of free ACh may account for the decrease in excitability of the cortex under conditions of anoxia and hypoglycemia. (Author's abstr.)

Accommodation and Autorhythmic Mechanism in Single Sensory Fibres.

The repetitive discharge in response to slowly rising linear stimuli has been recorded with the aid of micro-electrodes from cutaneous and muscular afferents. Single fibres could be isolated by placing the micro-electrode on the dorsal roots. Stimulus form and nerve response are pictured simultaneously with the aid of a double cathode ray oscillograph on the same film.

By this method it is possible to measure the sensory accommodation curves directly, and at the same time correlate them with the properties of the iterative discharge.

There is little, if any, accommodation in *N. saphenous*, representing cutaneous afferents (Hill's constant λ approaching infinity). For different muscular twigs of *n. popliteus* the values for λ range from 150 to 200 m.sec.

The autorhythmic discharge caused by the slowly rising stimuli consists of an initial phase during the time the stimulus rises and a later plateau-phase when the stimulus has reached a certain plateau level of strength. These two phases may be separated by a "silent period."

The plateau discharge is characterized by a frequency which increases with stimulus strength. It is independent of the accommodative resistance of the nerve.

The total adaptation time (from first to last impulse) of the plateau discharge is a function of accommodation and of stimulus strength, and decreases when the accommodative resistance increases or stimulus strength decreases.

Strong stimuli continued on plateau height inhibit the discharge (Schiff-Werigo's cathodal depression), provided that the nerves possess good accommodative resistance. It is suggested that the total adaptation time is largely determined by this factor.

The slowly rising stimulus sometimes causes a rhythmically grouped discharge instead of a continuous flow of impulses. (Authors' abstr.)

The Relation of Area 13 on Orbital Surface of Frontal to Hyperactivity and Hyperphagia in Monkeys.

The posterior portion of the external orbital gyrus (posterior orbital gyrus), which Walker has recently differentiated as a new cytoarchitectural area (area 13), and which Bailey, Bremer and Sweet (1, 2) have demarcated physiologically from adjoining areas, has been ablated in a series of monkeys. This procedure produces in a marked degree many of the symptoms that have been described for prefrontal lobectomy by various workers under the term hyperactivity. The results of area 13 lesions are as follows:

1. Hyperactivity is manifested by long-continued, methodical pacing or running of a regular, stereotyped character.

2. Hyperactivity from area 13 lesions is quantitatively great, is consistently obtained, and is always manifested in some degree within the first or second post-operative day; whereas similar hyperactivity from other prefrontal areas is said to be delayed in onset (as long as 2–3 weeks) and does not invariably occur.

3. Ablation of neighbouring regions by the same operative approach was without effect on activity.

4. Other motor activities are not marked by hyperactivity, but rather suffer reduction. Random, spontaneous activities and posturings are reduced in variety and quantity, as is emotional expressivity. There are also certain ill-defined behavior changes. All of these are most marked in the first post-operative week.

5. Hyperactivity is accompanied by a weight loss and only a slight increase in food intake. (Authors' abstr.)

Responses to Electrical Stimulation of Single Sensory Units of Skin.

Single sensory spots in the skin of human subjects can be conveniently stimulated by high voltage, low current spark discharges, without mechanical deformation of the skin.

The distributions of sensitivity over various regions, for touch and prick, show characteristic patterns. "High" spots of extreme sensitivity to electric stimulation are surrounded by areas of lower sensitivity. An area, varying in size in different regions, from less than 2 mm. to more than 15 mm., appears as a unit in the sense that any stimulus within it is referred to the same locus.

Prick has a much lower threshold than touch, except on the balls of the fingers, where touch threshold is lower.

Tactile endings associated with hair shafts can be differentiated from other tactile endings by the different sensory effects from electrical stimulation of suitable pattern.

Itch without accompanying prick can be elicited by low intensity, high-frequency stimulation of prick endings. Itch also follows as an after-effect of slowly repeated stimuli, each of which causes an initial sharp prick. The same sensory spot can give either touch, prick, itch or sharp pain, all below threshold for ordinary touch endings.

Certain theoretical inferences are offered as to the action of sensory endings, as indicated by the responses obtained by electrical stimulation. (Author's abstr.)

Action Potential and Enzyme Activity in the Electric Organ of Electrophorus electricus. *II: Phosphocreatine as Energy Source of the Action Potential.*

Breakdown of phosphocreatine and formation of lactic acid as a result of the discharge were determined on the electric organ of *Electrophorus electricus*. The energy supplied by these two chemical processes was compared with the electrical energy released. The following results were obtained:

1. The external electrical energy per gm. of tissue and impulse is, on the average, $8{\cdot}2 \times 10^{-6}$ gm. calories. The total electrical energy is at least twice as high. The amount of phosphocreatine split supplies per gm. and impulse on the average $32{\cdot}8 \times 10^{-6}$ gm. calories, that is, four times as much as the external electrical energy.

2. The amounts of acetylcholine and phosphocreatine metabolized as result of the discharge are of the same order of magnitude. This suggests that the energy of phosphate bonds is used for the resynthesis of acetylcholine.

3. The discharge leads also to lactic acid formation supplying an energy of $16{\cdot}8 \times 10^{-6}$ gm. calories per gm. and impulse. The chain of reactions supplying the energy required to restore the resting condition of the electric organ thus appears to be fundamentally identical with those which are the source of energy in muscle contraction. (Anthors' abstr.)

The Formation of Acetylcholine. A New Enzyme: "Choline Acetylase."

An enzyme has been extracted from brain and nervous tissue (electric organ) which forms acetylcholine. The formation occurs only in presence of adenosinetriphosphate (ATP). The enzyme is called choline acetylase.

The formation of ACh is greatly enhanced by fluoride which, according to Ochoa, inhibits adenosinetriphosphatase, but not the transfer of phosphate to a phosphate acceptor.

K^+ at a concentration between 2 and 6×10^{-2} M and NH_4^+ at a concentration between 2 and 8×10^{-2} M do not affect the enzyme. Cu, iodoacetic acid and iodine have a strongly inhibitory effect. The implications of these observations for the mechanism of nerve activity are discussed. (Authors' abstr.)

Effects on EEG of Chronic Lesions of Basal Ganglia, Thalamus and Hypothalamus of Monkeys.

1. In monkeys chronic lesions of the subcortical nuclei have been found to produce changes in the EEG, although lesions restricted to cortical tissue cause no such change.

2. Lesions of the basal ganglia, if large enough, or of basal ganglia and cerebral cortex, cause permanent alteration in the EEG.

3. Epilepsy, either clinical or subclinical and detectable by EEG, was a frequent finding following lesions to basal ganglia.

4. The changes of EEG following lesions of basal ganglia can be directly correlated with the functional changes in the monkey, and are similar to those seen in human children with chorea.

5. Lesions of the thalamus caused marked slowing of rate, irregularity of pattern and the appearance of high, slow, rounded waves at frequent intervals.

6. Lesions of the hypothalamus caused great slowing of the rate and diminution of amplitude. With large destruction practically no pattern of potentials remained.

7. This is in direct contrast to the effects of sleep, which are to increase amplitude and intensify the normal pattern.

8. It is suggested that the post-traumatic changes which appear in both man and monkey may be directly related to changes within the basal ganglia. (Authors' abstr.)

Hand and Foot Patterns of Low Electrical Skin Resistance: Their Anatomical and Neurological Significance.

1. Under normal conditions, that is, at ordinary room temperature, etc., the hands and feet, like the face, show sharply defined areas of low electrical skin resistance. On the hands these patterns usually include the entire palmar surface up to the line which divides the dorsal and ventral parts of the hand. The skin of this area shows a resistance about one-fourth that of the skin of surrounding areas. On the feet the areas of low electrical skin resistance usually include the entire plantar surface and a small band along the side of the foot and over the toes.

2. These areas become constricted in cold temperatures and during sleep, and become enlarged in warm temperatures and with exercise or excitement. When the patterns contract the tips of the fingers and the toes are the last to show a low resistance. When they expand the patterns first envelop all of the dorsal surface of the hands and feet, and then move up the arms and legs, showing regular sock and glove patterns.

3. The possible relationship of these areas to the distribution of sweat glands, blood vessels and hair was considered.

4. It was shown that the patterns do not conform to the distribution of any of the peripheral nerves or the sensory dermatomes. It was suggested that they might represent cortical or subcortical patterns of the distribution of sympathetic nerves to the extremities.

(Authors' abstr.)

Nature of Paresis Following Lateral Cortico-spinal Section in Monkeys.

Interruption of the lateral cortico-spinal tract in the spinal cord of the monkey results in a

paresis that is more prominent in the lower than in the upper extremity, and that is more pronounced in the distal than in the proximal muscle groups.

This paresis is characterized by hypotonicity, hypoactive reflexes, and absence of clonus, indicating that no descending inhibitory pathway whose interruption results in spasticity is present in the lateral cortico-spinal tract of the monkey. (Authors' abstr.)

Removal of Acetylcholine by Cholinesterase Injections and the Effect Thereof on Nerve Impulse Transmission.

Purified cholinesterase preparations, injected intravenously, are capable of acting within the animal body, thereby preventing the chromodacryorrhetic effect ordinarily obtained from injected acetylcholine.

It has been possible to prove, through the injection of these enzyme preparations, that acetylcholine plays an essential role in the transmission of nerve impulses to the sphincter pupillae. By measuring pupil diameters under constant experimental conditions, it has been demonstrated that the direct light reflex is partially or totally abolished by the injection of cholinesterase preparations, indicating that the integrity of the reflex depends on the presence of acetylcholine at some point or points in the pathway of the nerve impulse.

(Authors' abstr.)

The Basis for Repetitive Activity in Phrenic Motoneurons.

A single shock, applied to the inspiratory center in the medulla oblongata of the cat, leads to the discharge of impulses over spinal respiratory pathways for periods of 30 m.sec. or more. If the stimulus is weak and applied during expiration, it will cause few phrenic neurons to respond, but will facilitate those neurons to subsequent shocks if they follow the first at intervals of less than 30 m.sec. On the other hand, a strong stimulus produces this same facilitation, but since it causes large numbers of phrenic neurons to respond, it initiates subnormality in those neurons. For an initial period of 20 m.sec., the more short-lived facilitation outweighs subnormality, but the latter dominates the picture during the succeeding 100 m.sec.

Facilitation largely results from the continued delivery of impulses from center to motoneuron as a result of delay pathways or re-entry circuits within the center. Spinal interneuron repetitive activity plays a much less prominent role. Subnormality on the other hand is mainly resident within the phrenic motoneurons.

The repetitive discharge of phrenic neurons which characterizes normal inspiratory activity may be explained in terms of a balance between the degree of excitation of those neurons and their rates of recovery of excitability. (Author's abstr.)

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An Oscillographic Study of Olfactory System of Cats.

Following single shock stimulation of the olfactory bulb in the cat, potentials were recorded on and in the prepyriform cortex, the anterior olfactory lobe, the olfactory tubercle and the pyriform lobe. No responses were obtained in the septum, the diagonal band, the amygdaloid nuclei and the hippocampus.

The initial responses were surface negative on the prepyriform cortex covered by the macroscopically visible olfactory tract, on the olfactory tubercle and on the pyriform lobe. Laterally on the prepyriform cortex the initial responses were positive, and on the anterior olfactory lobe they were sometimes negative and sometimes positive. These findings were considered of interest, since other sensory cortices exhibit an initially positive potential following peripheral stimulation. The different sign of response on the olfactory cortex was attributed to the different orientation of discharging elements in this cortex resulting from the surface position and linear distribution of its afferent fibers.

Deeper in the prepyriform cortex and in the cephalic portion of the pyriform cortex the potentials were inverted and the initial response was positive. Caudally in the pyriform cortex the deeper intracortical records did not show this reversal in sign. Here the first wave was absent and only a later negative phase was present.

In the immediate vicinity of the lateral olfactory tract on the prepyriform cortex a fast negative spike or notch preceded the first negative wave. This spike or notch was conducted

unattenuated after a conditioning stimulus and was relatively resistant to anoxia. Indications are that it was due to impulses in olfactory tract axones.

Usually the records from the prepyriform cortex had a single negative potential, whereas the records from the olfactory tubercle and the pyriform lobe had two negative potentials. In all these regions the first negative potential could be enhanced and the second negative potential eliminated by a second stimulus.

The presence of transcortical connections through the prepyriform cortex to the pyriform cortex were indicated by a later negative wave, which persisted after rostral section of the olfactory tract and was dependent on stronger stimulation of the olfactory bulb.

In a few instances positive potentials along the external and internal capsules and in the putamen, the globus pallidus and the entopeduncular nucleus were recorded. The significance of these responses is not known. They may represent a pathway from the olfactory system, possibly to the striatum. (Authors' abstr.)

The Effect of Calcium on the Neuromuscular Junction.

The effect of calcium lack and excess on the neuromuscular junction has been investigated in frog's sartorius and isolated nerve-muscle fibre preparations of the M. adductor longus.

1. Reduction of ionized calcium in the surrounding fluid affects the endplate region prior to the nerve-endings and muscle fibres.

(*a*) Spontaneous activity resulting after immersion into citrate or calcium-free saline solutions originates primarily at the endplates.

(*b*) Reduction of calcium to one-third to one-fifth of normal first increases the excitability of the endplates as judged by repetitive response to a single nerve impulse. Also the sensitivity of the endplates to applied acetylcholine is 100-1,000 times increased. Subsequently neuromuscular block results, while the nerve-endings still conduct impulses and the muscle action potential set up by direct electric stimulation is not appreciably altered. It is suggested that the block is due either to (i) diminished production of the "transmitter," or (ii) diminished electric excitability of the endplate region.

2. The part of the sartorius immersed into calcium-free or calcium-deficient saline becomes negative relative to the rest of the muscle.

3. Excess of ionized calcium gradually blocks nerve-muscle transmission presumably by lowering the electric excitability of the muscle fibre adjacent to the endplate. (Author's abstr.)

Effects of Dorsal Root Section on Choline Esterase Concentration in Spinal Cord of Cats.

1. The concentration of choline esterase in the gray matter of the sixth lumbar segment of the spinal cord in cats has been determined, and the effects of unilateral and bilateral deafferentiation on the enzyme activity have been studied.

2. In normal cats the QChE values were, on the average, 13·7 and 13·9 in the left and right dorsal quadrant wedges respectively. In the left and right ventral quadrant wedges the values obtained were 17·6 and 18·6 respectively.

3. After unilateral deafferentiation, a decrease of about 10 to 20 per cent. was observed in all four quadrant wedges. After bilateral deafferentiation the percentage decrease was approximately twice as great, i.e. about 30 per cent. in all four quadrant wedges.

4. These results are compared with the effects of nervous degeneration on choline esterase activity in muscle and ganglia and the implications are discussed. (Authors' abstr.)

Functional Organization of Frontal Pole in Monkey and Chimpanzee.

Neither the older histological studies of the cortex nor those more recent stimulations which indicated that the eye field extended above the sulcus arcuatus had suggested the extent of the eye field disclosed in these experiments. The type of stimulation used was designed to evoke responses with a minimum spread of current, and the eye field thus disclosed had a sharp margin. Its continuation on the orbital surface was extremely narrow. Nevertheless, one might have thought that this lower extension depended upon spread of current to some underlying tract, had it not been for the fact that strychnine caused a suppression of electrical activity exactly as it did elsewhere in area 8, and that strychnine is known to act only upon cell bodies.

Strychninization of the frontal pole rostral to area 8 has revealed much greater differentiation and more complex interrelation of dissimilar areas than had been anticipated. The picture invites comparison with Brodman's cytoarchitectonic map, not of the monkey but of man, for the areas disclosed here functionally in the chimpanzee are as numerous as the areas distinguished anatomically by him in man. Unfortunately, they are so different in shape and arrangement as to make it impossible to homologize them. Far greater correspondence exists between these areas in the chimpanzee and those distinguished by von Economo in man—a correspondence which is enhanced by omission of those of his final subscripts which indicate a finer shade of cytoarchitectonic differentiation than can be confirmed with assurance.

The outstanding conclusion of the experiment is that with its relative increase in bulk the frontal pole of the chimpanzee, instead of resembling the ill differentiated frontal pole of the monkey, has come to resemble the highly differentiated and complex frontal pole of man. (Authors' abstr.)

The Distribution of Acetylcholine in Brains of Rats of Different Ages.

Estimations of the free ACh of brain tissues of infant, young and adult rats were made; also of the spinal cord and spinal nerves of adults. In rats less than one day old the medulla was found to be highest in ACh (0·6γ/gm.) and the pallium lowest (0·16γ/gm.). In adult rat brains the cerebellum was lowest (0·1γ/gm.) and the brainstem highest (0·58γ/gm.). In the adult rat the spinal cord was found to contain more ACh than any part of the brain and the spinal nerves more than the spinal cord. Taking the value of free ACh in the adult cerebellum as one, the other relative values are: Pallium = 2, medulla = 4, brain-stem = 6, spinal cord = 10, spinal nerves = 34.

When whole brains of infant, young and adult rats were extracted and assayed the free ACh of the infant brain was 0·1 γ/gm.; that of young rats was 0·2 γ/gm.; while adults yielded 0·4 γ/gm.

An attempt has been made to relate the regional distribution of ACh in the mammalian nervous system to other known properties and functions of the parts of this system. Except for the pallium, the changes in ACh level of the parts of the brain, with age, are fairly closely paralleled by changes in respiration, glucose utilization and glycogen storage. A close correlation has been shown between distribution of ACh and that of cholinesterase. It is pointed out that the order of increasing resistance of the parts of the nervous system to anoxia and hypoglycemia is essentially the same as the order of parts arranged to show increasing amounts of ACh per unit weight. That is, those parts which are least resistant to anoxia and hypoglycemia (cerebellum and cortex) are lowest in ACh; while those parts which are most resistant, at least to anoxia, are highest in ACh (spinal nerves, autonomic ganglia). (Authors' abstr.)

Functional Organization of the Medial Aspect of the Primate Cortex.

By physiological neuronography the following areas on or near the gyrus cinguli of the macaque and chimpanzee were identified. Area 24 in the anterior part of the gyrus is a suppressor area. Area 23, in the posterior and superior part, sends impulses to the preoccipital and parastriate areas and projects to the anterior nucleus of the thalamus in the macaque. Area 29, close to the splenium of the corpus callosum, was not found to have other cortical connections, but also projects to the anterior nucleus of the thalamus in the macaque. Along the sulcus cinguli there is a "cingular belt" homologous with areas 32 and 31, which receives connections from all known suppressor areas of the cortex (24s, 8s, 4s, 2s, and 19s), but does *not* project to them. Area 32 has commissural connections, but none has been demonstrated for area 31.

Areas on the medial surface of the frontal lobe of the chimpanzee, which may correspond to Brodmann's areas 10, 11 and 12, have been identified and their firing characteristics determined. These were not identified in the macaque. (Authors' abstr.)

Optic Nerve Regeneration with Return of Vision in Anurans.

1. In larval and adult anurans of six different species regeneration of the optic nerve resulted in a return of visual perception which was well organized, not an intermingled confusion. Distinct and consistent responses to position and direction of movement of objects in the visual field were recovered.

2. The orientation of visuomotor responses after recovery, however, was dependent upon the orientation of the retina. It was normal in animals whose retinas had been left in normal position, but reversed about the optic axis in animals whose retinas had been rotated through 180 degrees prior to nerve section.

3. The location of scotomas produced by localized lesions in the optic tectum after optic nerve regeneration indicated that optic fibers from different retinal loci had re-established functional connections in the same areas of the optic lobe to which they had originally projected (Author's abstr.)

The Peripheral Unit for Pain.

1. A unit of a sort for pricking pain can be isolated in the skin by anaesthesia of a nerve branch, after locating by electrical stimulation all points of maximal sensitivity in the nerve's distribution. Taking advantage of the scattering overlap between adjacent nerve branches, the smallest area remaining unanaesthetized after block of one branch, but completely bounded by anaesthetized areas, consists of one highly sensitive point surrounded by an area decrementing in sensitivity toward its periphery. The smallest area anaesthetized but bounded by sensitive areas is a similar unit.

2. These units overlap slightly, but the marginal region of overlap is the region of minimal sensitivity. Certain units appear to be innervated by each of two nerve branches, and more are probably multiply innervated by axons from the same branch.

3. If two such units are stimulated coincidentally or by alternate bursts, two-point discrimination between them then depends on degree of stimulation; the greater the stimulation, in terms of either strength or frequency, the closer together are two points recognizable as discrete. Two points discriminated as such do not summate in painful sensation, and vice versa. Some adjacent points mask each other, i.e. they neither summate in intensity of sensation nor are they recognized as separate spots.

4. Itch, non-painful prick and pain, elicited by appropriate patterns of stimulation from the same point, differ in quality as well as quantitatively.

5. This qualitative shift, with quantity of stimulation, and the shift from summation to two-point discrimination similarly induced, point to a central qualitative interpretation of sensory impulses depending only on quantitative factors involving identical peripheral mechanisms within the single modality of pricking pain. (Author's abstr.)

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Synthesis of Acetylcholine in Sympathetic Ganglia and in Cholinergic Nerves.

Feldberg investigated the superior cervical ganglion, the cervical sympathetic, vagus, and phrenic nerves, and motor roots in the cat. He concludes that synthesis of acetylcholine in sympathetic ganglia is a property of the preganglionic nerve-endings and a necessary preliminary for sustained synaptic transmission. The property appears to depend on intactness of some structural part of the tissue, probably the axone, since it is lost when mechanical destruction is carried too far (grinding with silica). Synthesis occurs apparently only to replace acetylcholine expended. When the cervical sympathetic trunk is cut, the distal portion and the ganglion lose their synthesizing power simultaneously with the loss of synaptic transmission, but while nerve conduction is still intact. This loss is among the first functional changes in degenerating cholinergic nerves. They apparently synthesize acetylcholine throughout their course in the same manner as in sympathetic ganglia. No synthesis was observed in sensory roots. M. E. Morse (Psychol. Abstr.).

Synaptic Potentials and Transmission in Sympathetic Ganglion.

When synaptic transmission through the cat's superior cervical ganglion is blocked by curare, a preganglionic volley sets up a local negative potential of the ganglion cells relative to their axones—the synaptic potential—which spreads decrementally along the post-ganglionic fibers. In these respects it resembles a catelectrotonic potential and is thus analogous to the end-plate potential of curarized muscle. Summation of the synaptic potential set up by two preganglionic volleys occurs, and if the summed potential is sufficiently high, the ganglion cells discharge impulses. Synaptic potentials set up by single or repetitive stimulation were analysed on the basis of Hill's local exponential theory. The processes involved in synaptic transmission and facilitation are discussed, particularly the so-called detonator facilitation, and it is concluded that most and possibly all evidence for such action may be attributed to the brief transmitter action. M. E. Morse (Psychol. Abstr.).

Recovery of Fiber Numbers and Diameters in the Regeneration of Peripheral Nerves.

Counts and measurements of the myelinated fibers in the rabbit's peroneal nerve were made at standard levels in the normal nerve, after crushing, after severance and suture, and after nerve grafts. Only after crushing was the nerve fully reconstituted as to number, size, and pattern of fibers. After suture and grafting the fibers in the peripheral stump were fewer and on the average smaller than those in the central stump. The bearing of these results on functional recovery is discussed. In crushing, the fibers are interrupted but remain opposite their own Schwann tubes. After suture, a particular fiber can enter one of many tubes and thus may be functionally "lost" through misdirection. Anatomical restoration remains incomplete long after the simpler functions have recovered, but different functions probably require different degrees of reconstitution. This is of considerable importance in man in restoration of delicate functions. The factors determining selection of fibers for maturation are unknown. Shunting is important in reducing the number of end-organs reached and in preventing maturation of large fibers in small tubes. M. E. Morse (Psychol. Abstr.).

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Slow Waves of Circulatory Origin in the Electroencephalogram.

During an investigation of the effects of emotional excitement on the normal EEG, very slow waves of 1–2 cycles per second were observed. As a slow brain rhythm has often been considered abnormal, further investigation was made, using two types of EEG's. The same type of slow waves was observed in the records of five schizophrenic and three normal subjects with no ascertainable organic abnormalities. These waves coincided exactly in frequency with simultaneously recorded pulse rate and showed no fast component. It is considered probable "that these slow potentials represent an electroarteriogram arising chiefly from the more richly supplied vascular areas of the cerebral cortex and the pia mater."

R. B. AMMONS (Psychol. Abstr.).

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Use of Metrazol in Barbiturate Poisoning.

1. The successful use and analeptic action of 36 c.c. of metrazol in a case of poisoning with 102 gr. of sodium amytal is reported.

2. A brief review of the literature on the pharmacology, animal experimentation and clinical use of analeptics in barbiturate poisoning is presented.

3. A comparative study of metrazol, picrotoxin and other analeptics as physiological antidotes in barbiturate poisoning is made.

4. The rationale for the use of metrazol in the case presented is fully discussed and indications for its use are given. (Author's abstr.)

The Prevention of Post-convulsive Asphyxia in Electric Shock Therapy.

1. A simple procedure, hyperventilation just prior to the shock, is suggested as a manoeuvre to prevent certain asphyxial episodes in the post-convulsive period of electric shock therapy.

2. Previously described methods of combating this complication are reviewed.

(Author's abstr)

The Rorschach Analysis of Psychotics Subjected to Neuro-Surgical Interruption of the Thalamo-Cortical Projections.

The Rorschach form-perception test was used pre-operatively and post-operatively, whenever conditions permitted, in a series of 20 psychotic patients subjected to therapeutic bilateral prefrontal lobotomy. A continuing clinical follow-up was made on each patient for periods ranging up to one year. Because of the severe psychotic subjects dealt with and other factors tending to reduce the number of cases available for reliable comparative studies, it was not possible to compute quantitative relationships on the basis of age, sex, or diagnosis. Qualitatively, the study revealed that the changes from pre-operative records to post-operative records are not very large in most cases, and that atypical signs present in the post-operative records are frequently anticipated in the pre-operative records. In the post-lobotomy course, Rorschach improvement may, or may not, run parallel with clinical improvement. An analysis of the post-operative scoring signs revealed the presence of several of Piotrowski's criteria of intracranial damage, but since they frequently appeared in the pre-operative picture, it was felt that they were more a function of the psychotic processes than of the lobotomy. In general, it appears that the neurosurgical transection of the frontal association areas plays a less important role in the reorganization of the Rorschach patterns than does the prepsychotic and pre-operative personality structure. (Author's abstr.)

Fluctuations in the Mental Level of Schizophrenic Patients.

Thirty schizophrenics whose average age was 28·1 years were examined and re-examined by means of the Wechsler-Bellevue scales. The results were compared with those obtained from 30 non-schizophrenic State hospital patients with a mean age of 38 years who were also tested, then re-tested after some time. The intervals between test and re-test for both groups ranged from 1 to 35 months, with a mean of slightly more than 13 months for both groups.

The results tabulated and discussed justify the following conclusions:

1. The large majority of the schizophrenic patients show a rise in mental level, indicating a higher degree of mental efficienoy. This rise is probably due to two major factors: (*a*) The improved clinical picture of the patients; (*b*) the practice effect involved in the employment of the same scale. The greatest number of mental level decreases may be found in the catatonic group. Because of the small numbers involved, these results cannot be considered conclusive.

2. The verbal scale of the Wechsler shows comparative stability, and is probably a close approximation of the patient's potential level. Considerable changes may be noted in the performance scale. The speed factor is of prime importance in the performance scale. The changes in it are most likely due to better initiative, "mental energy," co-operativeness, and increased alertness on the part of the patients.

3. The outstandingly poor coefficient of correlation on the comprehension test shows considerable fluctuation in the schizophrenic's practical judgment—more so than any other function measured by Wechsler's scales. It seems to offer to the patient the greatest opportunity of demonstrating schizophrenic thought disturbance.

4. The intrascale deviations from the mean show larger variations in the schizophrenics as well as in other hospital patients than in non-psychotics.

5. The total distribution of the schizophrenic group and its individual subtests, both on test and re-test, does not show any significant differences when compared with the measures of variability for the non-schizophrenic as well as non-psychotic distribution.

(Author's abstr.)

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Parallelism in Changes of Sensory Function and Electroencephalogram in Anoxia and the Effect of Hypercapnia under these Conditions.

Experiments are reported in which the electroencephalogram (EEG), the critical visual fusion frequency (CFF) and the pulse-rate were recorded in five subjects under anoxia and under control conditions, in order to determine whether any correlation exists between the subjective sensory changes observed in anoxia and the activity of the brain as recorded by the EEG.

It is shown that conditions of anoxia leading to a decline in CFF are accompanied by typical anoxic changes in the brain as demonstrated by the EEG. Degrees of anoxia which do not alter the CFF significantly have no effect on the EEG. The experiments suggest that the subjective changes in visual functions observed in anoxia are not due to ill-defined psychic factors, such as lack of attention or lack of co-operation, but are due to an actual impairment of the neurons of the retino-geniculatestriate system.

Addition of 3 per cent. carbon dioxide to oxygen-nitrogen mixtures greatly alleviates or completely offsets the effects of anoxia. This holds true not only for the general symptoms (dizziness, perspiration, general discomfort, etc.), but also for the effects of anoxia on the CFF and EEG. Under the conditions of these experiments there is likewise a parallelism between subjective (sensory) and objective (EEG) changes. The mechanism involved is discussed and the fact is emphasized that the pulse-rate rises more when oxygen-nitrogen mixtures are inhaled than when similar oxygen-nitrogen mixtures are used to which 3 per cent. carbon dioxide had been added. (Authors' abstr.)

Electroencephalographic Studies in Asthma with some Personality Correlates.

Fifty-four male cases of bronchial asthma have been studied from the point of view of electroencephalographic and personality data.

The electroencephalographic data indicate a definite relationship between bronchial asthma and a dominant alpha record, i.e., about three times as many dominant alpha records were found in the asthmatic group as in a normal group.

Dominant alpha records have been correlated with passive, receptive types of individuals. This has been determined by previous studies.

The author's personality data would seem to indicate that in general we are dealing with a single, fairly definite personality constellation. Their patients appear to be a fundamentally passive dependent group who are the children of an over-protective, dominating mother. They have not cared for, striven for, or gained any marked degree of independence in life, and continue to seek care and protection from the environment.

Their results would indicate, therefore, a close relationship between bronchial asthma and a fundamental passive dependent personality structure, by the criterion of high dominant alpha index correlation with established passive personality.

These findings would seem to show the value of this type of study for the better understanding and evaluation of the underlying personality structure and psychic factors in patients with this disease and in psychosomatic problems generally. Some further implications of this study are pointed out and discussed. (Authors' abstr.)

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Phenomenology of Mescaline Intoxication and Functional Analysis of Thought During its Course.

In three cases of intoxication from ingestion of mescaline sulphate the principal introspective results showed close analogies with the course of the schizophrenic consciousness as presented by Zucker. A basic perceptual disorder was the inability to form adequate gestalten; on the expressive side this corresponded to distortion of "intentionality." Visual and auditory thresholds were lowered, while other senses were restricted. Complete introspective protocols for the course of intoxication in the subjects (medical students) are given, together with an extensive bibliography covering various phases of the topic.

H. D. Spoerl (Psychol. Abstr.).

REV. PSIQUIAT. CRIM., B. AIRES.

VOL. VI. 1941.

Fertility of Psychopaths.

This is an examination, derived from German statistics, of the necessity for and the results to be expected from the German sterilization laws. The statistics showed that none of the categories affected had a fertility above that of the general population, and among schizophrenics and epileptics there was evidence of biological autoelimination. Little is known of the etiology of psychopathies, and especially it is unknown whether pathogenic genes may also carry favorable factors and what regenerative powers may accompany degenerative factors. Dominant inheritance is not usual in the psychopathies, and the extent of recessive inheritance is unknown. These laws are not only inefficacious, but their spirit is opposed to the medical, legal, and moral principles of civilized peoples. In Germany they have caused, as deplored by their leading advocate, Rudin, a decline of interest in psychiatry. The facts here presented should lead to a powerful counter-movement of prevention through mental hygiene and advances in psychiatry.

M. E. Morse (Psychol. Abstr.).

Rorschach's Test and Bernreuter's Personality Inventory in Homicides.

Serebrinsky made a comparative statistical analysis of the Rorschach test and Bernreuter inventory on 131 homicides. By both methods the great majority of the subjects showed emotional instability. The most interesting finding was the relation between color and movement responses and certain aspects of the inventory. Neurotic tendency (introversion, emotional instability) was connected with color responses. Their predominance was, in fact, a measure

of neuroticism according to the inventory. Movement answers were apparently allied to self-sufficiency and domination. The tendency to dominate was low, but higher among the introverts than the extraverts. Although these results express only an orientation and may be affected by the conditions of prison life, they are pertinent because few attempts have been made to corroborate the results of the Rorschach test by other psychological measures.

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

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Nail Biting: Contribution to the Study of the Pathology of the Person.

This study of 436 nail biters illustrates over-determination of a symptom. Both phylogenetically and ontogenetically nail biting represents primarily autoaggression and destruction

(" tooth and nail "). The anxiety factor is masked by various others, all characterized by forced suspension of activity, e.g. masochistic pleasure of exasperation. As to choice of discharge, jaw movements in general as outlets for tension are more important than usually recognized. Nail biting gives a maximum subjective effect by inconspicuous, socially inoffensive means. It is rarely the resort of very abnormal children. Another root of nail biting is probably in the collective unconscious (magic significance of the nail). Although the children are of the " nervous " type, analytic study often yields little concrete material because the habit creates little conflict. It has slight intrinsic significance, but if attacked directly it may become secondarily neuroticized. M. E. MORSE (Psychol. Abstr.).

The " Unloading Function " of the Convulsion. Psychodynamics of Electric Shock Therapy.

Fleischer believes that the benefits of convulsive therapy are due primarily to the individually and socially harmless discharge of great amounts of aggressive energy which would otherwise be turned against self or others. The resultant increased libido, turned toward the physician, permits an analytic approach. The feeling of helplessness is unimportant therapeutically, and the anxiety effect is limited to the amnesia factor. This theory would explain why the best results of convulsive treatment are attained in melancholia, and the inadequacy of *petit mal* reactions. A new field lies in the obsessive neuroses in which the aggressive drive is strong. The meaning of the motor sphere for aggressiveness and its role in idiopathic epilepsy and manic attacks are discussed. M. E. MORSE (Psychol. Abstr.).

Vegetative Nervous System. Questions of Organization, Concepts and Nomenclature.

In view of misunderstandings and differences of opinion, Hess restates and clarifies his conception of the vegetative nervous system. He divides it into the ergotropic and histotropic portions, which correspond in general, but not wholly, to the sympathetic and parasympathetic divisions. His conception, and therefore his nomenclature, are based on the functional plan of the vegetative system, rather than the topography of the roots. The co-ordinated effect on the total organism, not on isolated organ-systems, is the guiding principle.

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

The Prepsychotic Personality of Shock-resistant Schizophrenics.

This study is based on 90 shock-resistant patients, the majority 30–40 years old. The duration of the disease averaged 6½ years, and hospital residence was less than one year. The results show that the shock-resistant group contained many more abnormal personalities, especially schizoid psychopaths, than the shock-susceptible group. There was no difference in intelligence between the two groups. The total schizophrenic group contained a third division, the constitution of which has not yet been investigated. These are neither resistant nor apparently curable, but are improved socially by shock therapy, although still showing schizophrenic defect. Constitution determines both the spontaneous course of the disease and the results of treatment. Under the right indications, however, shock therapy is very valuable.

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

Studies on the Clinical Course and Family Picture of Shock-resistant Schizophrenics.

This investigation was made on 90 shock-resistant patients, the majority 30–40 years old. The periods of observation after treatment ranged from six months to five years. The most important finding is that the clinical course of the disease, both in the patient and affected members of the family, was characterized by a constitutionally determined malignancy. This constitutional element is not affected by treatment; 80–90 per cent. of the shock-resistant cases pursued an uninterrupted downward course, as contrasted with less than 10 per cent. of the shock-susceptible. This study emphasizes the overwhelming significance of constitutional influences for the prognosis of shock therapy in schizophrenics.

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

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The Construction of a Test for Measuring Character Traits. *Hsü, E. H.* . . No. 1.

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The Rorschach Test as Aid in the Differential Diagnosis of True and Tetanic Epilepsy. *Weissenfeld, F.* 1

1. Physiology, Pathology, Biochemistry, etc.

The Significance of Spinal-fluid Cholesterol in Differential Diagnosis. Kujath, G. [*Allegm. Z. Psychiat.*, **121**, 249–62 (1943).]

Cholesterol (I) was determined in the spinal fluids (II) of a large number of children with various chronic and acute diseases of the central nervous system as follows: Dry 1 or 2 ml. of (II) in a desiccator, extract with $CHCl_3$–C_2H_5OH (1 : 1), dry, extract the residue with $CHCl_3$, apply the Liebermann-Burchard reaction, and read in a photoelectric colorimeter. Fairly good agreement between analyses on 1- and 20-ml. portions of the same (II) was obtained in 9 comparisons. In " normal " children (some with retarded development) the concentration of (I) in (II) ranged from 0·16 to 0·36 mgm. per 100 ml.; 0·4 mgm. is taken as the upper limit of normal. The (I) concentration was above normal in 26 of 43 cases with clinical evidence of stationary brain atrophy; in 5 of 8 cases of idiocy with neurologic symptoms; in 15 of 25 cases of idiocy with abnormal and in 2 of 3 cases with normal encephalograms; in 8 of 9 cases of idiocy with symptomatic seizures; in 4 cases of hydrocephalus; in 3 of 5 cases of congenital lues; in 3 of 13 cases of congenital feeblemindedness; and in 1 case each of tuberous sclerosis and epilepsy during and after a seizure. WARREN M. SPERRY (Chem. Abstr.).

A Glutamine-like Substance in Blood and Spinal Fluid, including a Method for its Determination. Harris, Meyer M., Roth, Roslyn T., and Harris, Ruth S. [*J. Clin. Investigation*, **22**, 569–76 (1943).]

A glutamine-like substance appears to occur in blood and spinal fluid, as supported by the following facts: (1) Certain tissues of the body contain glutaminase which can synthesize glutamine; (2) glutamine has been isolated from horse meat; (3) the parallel behavior under various conditions of hydrolysis of glutamine and the glutamine-like substance; (4) the probable formation of pyrrolidone-carboxylic acid by the glutamine-like substance in blood plasma.

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

The Tryptophan Test in General Paresis. Madonick, M. J., and Lissman, J. [*J. Lab. Clin. Med.*, **28**, 338–43 (1942).]

The tryptophan test was performed on the spinal fluid of 133 paretic persons. A positive response was obtained in 82 per cent. of the cases. It was positive in 3 cases of taboparesis and negative in 4 cases of tabes. Five of 13 cases of psychosis with meningovascular or cerebral syphilis gave a positive response. In a control group of 102 patients without syphilis, only 2 cases, one of cerebral arteriosclerosis and the other of rheumatic fever, gave a positive reaction. The test is most often positive in cases of syphilis with a paretic gold curve, but does not occur in other diseases as multiple sclerosis where a paretic gold curve is present without syphilis. The test is not dependent upon a quantitative increase in the total protein of the spinal fluid. Previous work in the literature is discussed and results tabulated. In the performance of the test it is essential that the fluid be clear. HOWARD W. ROBINSON (Chem. Abstr.).

The Shellac Reaction on 1,400 Spinal Fluid Samples. Kutscher. [*Deut. med. Wochschr.*, **67**, 1201–4 (1941).]

The spinal fluid is mixed with an equal volume of a commercially available shellac solution. Normal fluids remain clear, whereas pathological specimens become cloudy. The reaction is more sensitive than either the gold sol or mastic reactions as commonly used, and avoids the false positive results sometimes obtained with the Pandy reaction.

ARTHUR GROLLMAN (Chem. Abstr.).

The Glucose Content of Cerebrospinal Fluid in Meningitis. Schuster, G. [*J. pharm. chim.*, **2**, 170–2 (1942); *Chem. Zentr.*, **11**, 678 (1942).]

The glucose content of cerebrospinal fluid was studied in 42 patients during a meningitis epidemic. In 37 cases there was a marked rise in glucose. As the meningitis symptoms disappeared the glucose concentration returned to the normal level.

S. MORGULIS (Chem. Abstr.).

The Colloid Chemistry of the Hydrochloric Acid-collargol Reaction. Duensing. [*Arch. Psychiat. Nervenkrankh.*, **115**, 157–73 (1942).]

The reaction, devised by Riebeling (*C.A.*, **32**, 5488[5]), measures in a series of increasing dilutions the protective action of spinal fluid (I) against the coagulation of collargol (II) by 0·002 N HCl. In dilutions up to 1 : 10 or 1 : 15 the absence of coagulation is explained by the buffering action of normal (I). The ultrafiltrate of normal (I) protects as well as (I) itself. The protective action of pathology (I) in higher dilutions is ascribed to the increased quantity and to the quallty of the protein (III); ultrafiltrates of such fluids give no greater protection than normal (I), and on the average fluids with the highest (III) concentration give the greatest protection. But there is no direct proportion between (III) concentration and degree of protection; small concentrations of (III) frequently exercise a disproportionately large protective action. This is explained as follows: With increased concentrations of HCl, up to 0·01 N, the zone of

protection against coagulation of (II) is unexpectedly increased up to higher dilutions of normal (I), because the more positively charged (III) formed through action of the HCl has a greater protective action; for the same reason small increments of (III) in pathology (I) have a large effect and the high sensitivity of the reaction is thus explained. Serum (III), precipitated by dialysis, was dissolved in physiological NaCl solution, in (I) ultrafiltrates, and in a solution of salts, buffered with phosphate to simulate the ultrafiltrate. Typical pathological curves of (II) coagulation were obtained with the last two, but not with the first preparation; it is not necessary to assume the presence of unknown bodies to explain the findings in pathological (I). The frequent finding in pathological (I) of a zone of precipitation followed by a zone of protection as the dilution is increased is related to differences in the isoelectric point of the (III) present in different diseases. In the region of the isoelectric point the (III) does not protect, but on the acid side, reached in larger dilutions where the buffering effect of (I) is less, (III) protects again against coagulation of (II). No difference in buffer capacity between normal and pathological (I) was observed. WARREN M. SPERRY (Chem. Abstr.).

A Study with Radioactive Isotopes of the Permeability of the Blood-cerebrospinal Fluid Barrier to Ions. Greenberg, David M., Aird, Robert B., Boelter, Muriel D. D., Campbell, W. Wesley, Cohn, Waldo E., and Murayama, Makio M. [*Am. J. Physiol.*, **140**, 47–64 (1943).]

The permeation of ions from the blood-stream into the cerebrospinal fluid is generally a slow process. Many hours are required for the labelled ions the normal ratios found by chemical analysis. The results favor the secretion theory of formation of the cerebrospinal fluid.
E. D. WALTER (Chem. Abstr.).

Relation of Cholinesterase to Acetylcholine and Blood-Pressure Variations. Reichert, Willi, and Frisch, Wolfgang. [*Arch. exptl. Path. Pharmakol.*, **200**, 235–43 (1942).]

In narcotized cats the prolonged slow injection of acetylcholine or acetyl-β-methylcholine produced a marked decrease in the cholinesterase activity of the blood. Drugs which increase blood pressure do not increase blood cholinesterase activity. The latter is independent of the blood pressure and the circulatory regulating mechanism. L. E. GILSON (Chem. Abstr.).

Acetylcholine and the Physiology of the Nervous System. Fulton, J. F., and Nachmansohn, D. [*Science*, **97**, 569 (1943).]

It has been difficult to reconcile the extremely rapid events taking place in neural activity with what was presumably a process requiring considerable time, namely, acetylcholine release. Recent experimental work shows: (1) that choline esterase is localized at the neuronal surface (this allows for rapid hydrolization of acetylcholine), and (2) a parallelism is found between the amount of choline esterase present and the E.M.F. produced by the electric organs of *Electrophorus electricus* and *Torpedo*. The electric organs of these specimens have present an amount of choline esterase to hydrolyse in 60 minutes, several kilograms of acetylcholine, i.e. several milligrams in one millisecond. "This high rate of metabolism makes possible the assumption that acetylcholine is closely connected with the discharge." Such evidence indicates that acetylcholine is an essential link in the generation of the electrical changes recorded during both axon and synaptic activity. F. A. MOLE, jun. (Psychol. Abstr.).

Effect of Glutamic Acid on the Formation of Acetylcholine. Nachmansohn, D., John, H. M., and Waelsch, Heinrich. [*J. Biol. Chem.*, **150**, 485–6 (1943).]

The addition of l(+)-glutamic acid to dialyzed extracts of rat brain in concentration of 2×10^{-2} M increased the rate of formation of acetylcholine (I) about 4–5 times. d(−)-Glutamic acid had a small effect. l(+)-Aspartic acid, dl-serine, l-malic and α-ketoglutaric acids had no effect. dl-Alanine and dl-methionine and glutamine increased the rate of formation of (I) about twice at a concentration of 2×10^{-2} M. Succinic acid increased the rate about twice and citric acid about 4–6 times. Are these active substances coenzymes of choline acetylase?
RACHEL BROWN (Chem. Abstr.).

The Nicotinic Acid Content of Cereals and Pellagra. Aykroyd, W. R., and Swaminthan, M. [*Bull. mens. office intern. hyg. publ.*, **33**, 507 (1941); *Chem. Zentr.*, **11**, 679 (1942); *cf. C.A.*, **34**, 7364[9].]

Wheat contains 5 mgm. per cent. nicotinic acid, barley 3 mgm. per cent., rice 2–4 mgm. per cent., corn and rice meal 1·5–2·0 mgm. per cent. Feeding experiments on Rumanian families suffering from pellagra showed that rice contains less nicotinic acid than corn. Hence, the low nicotinic acid content of corn is obviously not an etiological factor in pellagra.
E. O. WHITTIER (Chem. Abstr.).

Studies of Urinary Pigments in Pellagra and other Pathological States. (1) *Clinical Observations. Watson, Cecil J., and Layne, John A.* [*Ann. Internal Med.*, **19**, 183–99 (1943).]

The chromogen (probably indoleacetic acid) which gives the urorosein reaction is a normal constituent of the urine of many individuals who have no evidence of nicotinic acid deficiency. Some urines contain an unknown oxidizing agent which yields a spontaneous reaction for urorosein. There is no relation between the administration of nicotinic acid and the presence

of either the chromogen or the oxidizing agent. The spontaneous reaction occurs only in diseased and is much more frequent in deficiency states.

(2) *The Excretion of Porphyrin and the Urorosein Reaction in Dogs with Experimental Black Tongue.* [*Ibid.*, 200–5.]

The spontaneous urorosein reaction was absent in urine from four dogs with experimental black tongue. The appearance of red color in the toluene preservative of dog urines was not correlated with nicotinic acid deficiency. There was no significant increase in coproporphyrin in dogs with black tongue.

(3) *Certain Toluene Soluble Pigments of Human and Canine Urine. Schwartz, Samuel, Marvin, James, Layne, John A., and Watson, C. J.* [*Ibid.*, 206–12.]

The red pigment extracted by toluene from certain human and canine urines was shown by chromatographic analysis to be composed of several pigments. Two of them each obtained from human urine were similar to but not identical with indirubin.

JOHN T. MYERS (Chem. Abstr.).

Pellagra and Nicotinic Acid. Ferrero, S. [*Arch. ital. med. sper.*, **4**, 1033–48 (1939); *cf. C.A.*, **33**, 3846[6], [8], 8707[6]; **34**, 2427[4]; **35**, 161[5]; **36**, 165[9], 6205[7].]

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

Action of Vitamins on Nervous Centers. Chauchard, P. [*Compt. rend.*, **214**, 130–3 (1942); *cf. C.A.*, **36**, 2594[5], 3533[6]; **37**, 4437[1].]

After intraperitoneal injection of vitamins, measurements of chronaxie in adequately fed rats, rabbits and guinea-pigs show that correct functioning of various nervous centers directly depends on the provision of appropriate amounts (equal to those required to prevent deficiency) of vitamins, and that excess or deficiency of these produces characteristic changes (stimulation and (or) depression) in nervous excitability. In some cases antagonism or synergism among vitamins is observed. The extent and duration of the changes usually depend on the dose of vitamin.

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

Vitamin B_1 Deficiency and Attempts to Produce Poliomyelitis in White Rats. Toomey, John A., Prohring, Wm. O., and Takacs, Wm. S. [*Proc. Soc. Exptl. Biol. Med.*, **54**, 153–4 (1943).]

The experiments gave no evidence that vitamin B_1 deficiency will in any way make white rats more susceptible to Flexner's M. V. poliomyelitis cotton rat-adapted strain.

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

The Liberation of Aneurine by Stimulating Nerves. Muralt, A. v., and Zemp, J. [*Arch. ges. Physiol.* (*Pflüger's*), **246**, 746–8 (1943).]

Resting and stimulated sciatic nerves of frogs were analyzed for their content of thiamine by noting the growth-promoting effect of extracts of these nerves on a culture of Phycomyces. The stimulated nerves contained 2γ of thiamine per gm. of tissue more than the resting ones.

ARTHUR GROLLMAN (Chem. Abstr.).

Chemical Factors in Nerve Growth Studied in Tissue Culture: Vitamin B_1 and the Growth of Spinal Ganglia. Burt, Agnes S. [*J. Cellular Comp. Physiol.*, **21**, 145–59 (1943).]

Between the normal physiological range and limits of toxicity, vitamin B_1 has no effect on axon growth in tissue culture.

A. D. HASLER (Chem. Abstr.).

Effect of Iodoacetate on Respiration and Glycolysis in Excised Rat Brain. Fuhrman, Frederick A., and Field, John, 2nd. [*J. Cellular Comp. Physiol.*, **21**, 307–17 (1943).]

All concentrations of iodoacetate tested which inhibited anaerobic glycolysis also ultimately inhibited O consumption. Fermentation and O uptake in excised rat cerebral cortex are not separable by treatment with iodoacetate.

A. D. HASLER (Chem. Abstr.).

Active Substances in Nerve Stimulation. Muralt, A. v. [*Arch. ges Physiol.* (*Pfluger's*), **245**, 604–31 (1942); *Chem. Zentr.*, **11**, 1592 (1942)].

MAURICE M. RATH (Chem. Abstr.).

Electroencephalographic Study of the Action of Latrodectus mactans *Spider Bite. Oderiz, J. B., and Sampayo, R.* [*Rev. soc. argentina biol.*, **19**, 27–36 (1943).]

Changes produced in the electroencephalograms of dogs, cats and guinea-pigs indicate that *Latrodectus mactans* venom is a neurotoxin having a diffuse action on the entire central nervous system. Administration of antiserum returns the encephalographic tracings to normal rhythm.

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

The Action of Sympathomimetic Amines on the Respiration of Tissues in vitro. de Meio, R. H. [*Anales asoc. quim. argentina*, **31**, 80 (1943); *cf. C.A.*, **37**, 5145[2].]

There was studied the action of β-phenyl-β-hydroxyethylamine (I), ephedrine (II), and benzedrine (III) on the respiration of the retractor penis (dog), uterus and liver (rabbit), and diaphragm and intestine (rat); the Warburg technique was used. In their effect on the dia-

phragm, liver and uterus, the three resemble adrenaline (studied by others). The intestine shows inhibition. Respiration of the retractor penis is distinctly stimulated by the three amines. The concentration limits at which increase was observed were with (I), 2×10^{-8} M, with (II) and (III) 10^{-7} M. The first is more active than adrenaline (concentration $0{\cdot}55 \times 10^{-7}$ M), and none of them shows the inhibition clearly observed in the case of adrenaline at concentrations below $0{\cdot}55 \times 10^{-9}$ M. E. M. SYMMES (Chem. Abstr.).

Hypertension and Loss of Pressor Response to Angiotonin as the Result of Trauma to the Central Nervous System and Severe Hemorrhage. Page, Irvine H. [*J. Exptl. Med.*, **78**, 41–58 (1943).]

Angiotonin refractoriness and hypotension follow upon injury to the central nervous system in dogs and cats. The syndrome develops in the absence of the kidneys and the suprarenal glands. Glycine, methylisothiourea (I) and rest are the only agents studied which tend to restore responsiveness, and the first two of these have only an irregular and temporary effect. There is a marked degree of specificity in the syndrome, because undiminished pressor responses to adrenaline, tyramine and (I) are observed during complete angiotonin refractoriness. Despite the prolonged hypotension, changes in the amount of plasma proteins and in the hematocrit readings are not striking. C. J. WEST (Chem. Abstr.).

A Study of Serum Protein in Epileptics. Klimes, K., and Láng, A. [*Arch. Psychiat. Nervenkrankh.*, **114**, 691–8 (1942).]

The total protein and colloid-osmotic pressure are normal, but the albumin : globulin ratio is decreased in epileptics. WARREN M. SPERRY (Chem. Abstr.).

Acetone Bodies and Creatine in Schizophrenia. Löfdendahl, Hillevi. [*Nord. Med.*, **12**, 896–7 (1942); *Chem. Zentr.*, **11**, 802 (1942).]

In 50 cases of schizophrenia examined the Me_2CO and creatine contents of the urine were normal; β-hydroxybutyric acid was above normal in 16 cases.

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

The Lactoflavin Content of the Central Nervous System and Its Significance. Leemann, H., and Pichler, E. [*Arch. Psychiat. Nervenkrankh.*, **114**, 265–89 (1941); *cf. C.A.*, **36**, 6603[5].]

The lacotoflavin (I) content of normal, human spinal cord was 2·30–2·85 γ/gm.; there was little difference among the cervical and upper and lower lumbar portions. No (I) was found in spinal fluid. The respiration of sliced guinea-pig brain was about the same in 0·9 per cent. NaCl alone; NaCl + 0·01 M phosphate (II) buffer, pH 7·6; NaCl + glucose (III); and NaCl + (II) and (III). The rest respiration (after addition of KCN) was very small in the absence of (III) and ceased after 30 minutes; with (III) it was much higher and it continued for over one hour. It is concluded that the yellow enzyme, which carries on the rest respiration after the heme system is immobilized, oxidizes only carbohydrate. In accordance with this hypothesis the striopallidum, which is rich in (I), gave a high and long-continued rest respiration in the presence of diluting (0·005 per cent.) (III), while the (I)-poor medulla oblongata showed a very low rest respiration. The feeding of a vitamin B_2-free diet to guinea-pigs for 2 months had no effect on the (I) content of 4 portions of the brain as compared with normal animals. Depleted guinea-pigs injected with 1 mgm. lactoflavin phosphate per day for three days preceding death showed a little lower (I) concentration. Sublethal doses of KCN, given for several days, did not affect the (I) concentration of the guinea-pig brain. The (I) content of several structures of infants' brains was about the same as the corresponding values found in adults, and (I) occurs in the brains of rodents at about the same level as in the adult human; but there is little or no Fe in the brains of rodents and human infants. From these facts it is concluded that the flavin respiration system is older phylogenetically and ontogenetically than the Fe system. The (I) and Fe concentrations and the total and rest (KCN) respirations are closely parallel in different structures of the adult human brain. The (I) concentration of several structures of the brain was determined in nine patients with diseases affecting the brain. Deviations from normal (decreases) were found only in one patient with myasthenia and one with a carcinoma of the bronchus with metastases in the cerebellum. An attempt to determine (I) in brain tissue with the fluorescent microscope was unsuccessful. WARREN M. SPERRY (Chem. Abstr.).

Carbohydrate Metabolism in the Central Nervous System. Huszák, I. [*Biochem. Z.*, **312**, 315–29 (1942).]

Ganglion cells and neurites show differences not only in the O_2-activating systems but also in the carbohydrate metabolism. The mechanism of carbohydrate metabolism in the white matter is in some respects like the muscle mechanism, the decomposition starting with glycogen and proceding through phosphorylated stages. In the gray matter the significant path of carbohydrate metabolism begins with glucose which, after phosphorylation, probably follows the same course as in the white substance, and resembles that of red blood cells and other tissues which can utilize glucose. The white matter, thus oxidizes glycogen and phosphorylated hexoses but does not attack glucose or other non-phosphorylated sugars. The gray matter, however,

uses glucose as its main nutrient, but this is oxidized only after phosphorylation. The phosphorylation of the glucose is initiated by adenosine triphosphate. In both white and gray matter the glycogen undergoes phosphorolysis. S. MORGULIS (Chem. Abstr.).

Gonadotropin Excretion in Normal Men and Women and Cases of Hysterectomy, Menopause, Migraine, Epilepsy and Eunuchoidism. Main, R., Cox, W., O'Neal, R., and Stoeckel, J. [*J. Clin. Endocrinol.*, **3**, 331–4 (1943).] KATHRYN KNOWLTON (Chem. Abstr.).

The Gonadotropic Activity of the Tuber Cinereum in Rats; Study of the Endocrine Activity of the Brain (Neuro-secretory Study). Weisschedel, E., and Spatz, H. [*Deut. med. Wochschr.*, **68**, 1221–3 (1942).]

The implantation of tissue derived from the vicinity of the tuber cinereum in the midbrain into infantile rats and mice induced a gonadotropic activity. The activity of the tissue was comparable to that obtained by hypophyseal tissue, and indicates a neurosecretory activity of the midbrain. ARTHUR GROLLMAN (Chem. Abstr.).

Heredity as an Etiologic Factor in Chronic Alcoholism. Lemere, F., et al. [*Northw. Med., Seattle*, **42**, 110 (1943).]

The explanation of alcoholism as a neurotic symptom is insufficient because most patients become normal when they stop drinking. The authors' studies of the family histories of 500 alcoholics indicate specific inherited susceptibility to alcohol, consisting in abnormal attraction to its effects. Alcoholism is four times more frequent in the families of excessive drinkers than in the families of normal drinkers. The relationship between inheritance of psychopathy and alcoholism is non-specific. Total abstinence is often an equivalent of alcoholism in that the abstainer avoids a substance to which he realizes his susceptibility. Inheritance is usually through the father or the mother's male relatives, probably due to the restraining effect of social disapproval of alcoholism in women rather than to sex-linked inheritance. The logical treatment is to deprive the alcoholic, through the conditioned reflex method, of his ability to escape reality and obtain abnormal pleasure from alcohol. M. E. MORSE (Psychol. Abstr.).

The Hyperventilation Syndrome and Its Importance in Aviation. Hinshaw, H. C., Rushmer, R. F., and Boothby, W. M. [*J. Aviat. Med.*, **14**, 100 (1943).]

Hyperventilation (voluntary, deep and rapid breathing) produces blurring of vision, numbness of the extremities, and in later stages muscular cramps, serious vasomotor collapse and unconsciousness. These symptoms are produced by the reduction of CO_2 in the blood, and may also result from spontaneous, unrecognized hyperventilation occurring under conditions of emotional strain, excitement and anxiety. This syndrome, which is now recognized as the physiological basis for some symptoms noted among persons of unstable nervous temperament, may also occur in normal individuals under conditions of emotional stress. Although the effects of extreme hyperventilation are well known, it has not been adequately emphasized that similar results are produced by mild hyperventilation continued over a long period of time. A few instances of probable spontaneous hyperventilation among flyers are discussed.

C. PFAFFMAN (Psychol. Abstr.).

Effects of Exposure to Oxygen at High Barometric Pressure on Higher Functions of the Central Nervous System. Bean, John W., and Wapner, Seymour. [*Proc. Soc. Exptl. Biol. Med.*, **54**, 134–5 (1943).]

Repeated exposure to pure O at 65 lb. gauge pressure had no effect on the ability of rats to learn a maze habit, but retention and memory of a maze previously mastered was adversely affected to a striking degree. L. E. GILSON (Chem. Abstr.).

The Importance of Electrolyte Equilibrium for the Reactivity of the Vegetative Nervous System. Jesserer, Hans. [*Deut. med. Wochschr.*, **68**, 857–62 (1942).]

The K+ and Ca ++ of the blood are controlled by the regulatory centers of the brain and play an important role in determining the reactivity of the vegetative nervous system. Normally the ratio of K : Ca is 2. In vagotonia the ratio is increased.

ARTHUR GROLLMAN (Chem. Abstr.).

Effect of Hormones on Contraction of Striated Muscle and on Cholinesterase Activity. Torda, Clara. [*Proc. Soc. Exptl. Biol. Med.*, **53**, 121–5 (1943).]

Dilute suspensions or solutions of various commercial preparations of anterior pituitary sex hormone, estrone, estradiol, progesterol, testosterone propionate and pituitary vasopressin increased the sensitivity of frog rectus abdominis muscle to acetylcholine and to K ion, and somewhat decreased the cholinesterase activity of brain tissue *in vitro*. Oxytocin had no such actions. Sensitivity of the muscle to K was also increased by desoxycorticosterone. A correlation between the threshold of excitability of the effect on cells and the presence of the above substances is suggested. L. E. GILSON (Chem. Abstr.).

Neuropathology Following Inadequate Nutrition. Peraita, M. [*Arch. Psychiat. Nervenkrankh.*, **114**, 611–48 (1942).]

A discussion of the nutritional situation in Madrid during and after the civil war.

W. M. SPERRY (Chem. Abstr.).

Dephosphorylation of Potato Starch by Brain Phosphatase. Samec, Max. [*Atti accad. Italia, Rend. classe sci. fis., mat. nat.*, **3**, 128–31 (1941); *Chem. Zentr.*, **11**, 668 (1942).]

A phosphatase preparation from dog brain was shown to be free from amylase and from maltase. It was allowed to act for eight days at 40° on a 3 per cent. solution of soluble starch in borate buffer at pH 9·2. It was dialyzed till free of B, electro-dialyzed to constant condition. It contained 0·012 per cent. P_2O_5, or only 7 per cent of that in the original starch. The P-free starch was a white, hygroscopic powder, not entirely soluble in hot water. Its molecular weight by osmosis was about 19,500. During dephosphorylation it lost viscosity, but gained only a little in reducing power. J. J. WILLAMAN (Chem. Abstr.).

Control of Conditions in the Hydrolysis of Cerebrosides for Their Volumetric Determination. Lanfranchi, Franco. [*Atti accad. Italia, Rend. classe sci. fis., mat. nat.*, **2**, 202–7 (1940); *Chem. Zentr.*, **11**, 816 (1942).]

Pure cerebron was isolated from bovine brain and tested by placing it in an alcohol solution (0·5 mgm. cerebron per c.c.) according to the method of Fawaz, Lieb and Zacherl (*C.A.*, **32**, 6073). These authors carried out the hydrolysis by taking 0·5–2 mgm. of substance in 4 c.c. of 11 per cent. HCl and holding at 110° for 20 minutes. Estimation of galactose according to the method of Kimmelstiel (*C.A.*, **24**, 3524) was in good agreement with the calculated value.

R. J. ALLGEIER (Chem. Abstr.).

Clinical Experiments on the Vegetative Nervous System with So-called Potential Substances. Wegemer, Ernest. [*Arch. expil. Path. Pharmakol.*, **200**, 428–54 (1942).]

Some known effects of acetylcholine, acetyl-β-methylcholine, synephrine and insulin are discussed. L. E. GILSON (Chem. Abstr.).

Nucleinate-like Action upon the White Blood Cells of the Ether-insoluble Fraction of Lipoids from Beef Brains. Tompkins, Edna H. [*Bull. Johns Hopkins Hosp.*, **72**, 347–70 (1943); *cf. following abstract.*]

Intravenous injections of rabbits with ether-insoluble fraction of brain lipoids had the same effect on white blood cells and bone marrow as intravenous injections of sodium nucleinate. Individual injections were followed by neutropenia within a half-hour; neutrocytosis began 1–4 hours after injection, reached a peak 2–12 hours after injection and returned to normal in 8–24 hours. Decrease of lymphocytes began slightly later but continued for 11–12 hours. Monocytes tended to parallel the changes in lymphocytes. Fragmentation of neutrophils and erythrocytes was observed, as well as the appearance of young neutrophils and increased numbers of nucleated red cells from the third to the eighth hour after injection. Repeated injections of the brain lipoids caused sustained leucocytoses, increase of polymorphonuclears and lymphocytes, and myeloid hyperplasia of the marrow. ZELMA BAKER MILLER (Chem. Abstr.).

Metabolism of the Perfused Dog Brain. Handley, Carroll A., Sweeney, H. Morrow, Scherman, Quinten, and Severance, Robert. [*Am. J. Physiol.*, **140**, 190–6 (1943).]

A method of isolating the circulation to the dog brain and a perfusion technique are described. Approximately 50 per cent. of the O supplied to the head region is used by the brain. The brain accounts for about 8 per cent. of the total O consumption of the body at rest.

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

Study of 100 Abnormal Electroencephalograms. Vasconcelos, R. [*Rev. med. Hosp. Gen., Mex.*, **3**, 580–97 (1941).]

The author found that the tracings of epileptics, focal and idiopathic, could be divided into three classes: those corresponding to mild epilepsy, Jasper's paroxysmal dysrhythmia; curves showing the anomalies described by Lennox and Gibbs; and total or almost total disorganization of severe epilepsy. Of nine cerebral tumours six were localized exactly by the EEG, as proved by operation or autopsy. M. E. MORSE (Psychol. Abstr.).

The Encephalophone: A New Method for Investigating Electroencephalographic Potentials. Beevers, C. A., and Furth, R. [*Nature, Lond.*, **151**, 110–11 (1943).]

A method is described by which EEG changes are converted to changes of pitch of a musical tone by producing a change in beat frequency of two independent high-frequency oscillators. Alpha and beta rhythms give characteristic trills, while the slow waves frequently found in pathological conditions give correspondingly slow sweeps of tone. This audio method is recommended for clinical use, as distinct from research where permanent recording is essential.

C. G. MUELLER (Psychol. Abstr.).

Clinical and Encephalographic Observations in Severe Epilepsy under Treatment. Goldman, D. [*Amer. J. med. Sci.*, **205**, 388–99 (1943).]

This is a report on 16 cases of epilepsy, the majority severe and long-standing, treated over a period of three years with dilantin and phenobarbital. They were classified 1–5 according to severity. Every case was definitely modified, and most were markedly improved. Class 1 patients had no symptoms for considerable periods, and their performance gave evidence of recovery. The changes in their EEG's were greater than would be expected from reports based on shorter periods of observation, the EEG's becoming eventually indistinguishable from normal. Tracings from Classes 3 and 4 showed marked improvement. It seems reasonable to hope that adequate and sustained treatment of convulsive disorder in the early stages, under EEG control, may result in complete relief and prevention of progressive deterioration.

M. E. Morse (Psychol. Abstr.).

Neural Mechanisms of the Electrical Rhythms of the Cerebral Cortex. Obrador Alcalde, S. [*Ciencia, Méx.*, **3**, 193–201 (1942).]

Accumulating research on brain waves has emphasized the synchronous character of the currents. Cortical rhythms are elaborated upon this synchronization of neural units, which is essentially an unknown process. In the central nervous system there is a close connection between the cortex and subcortical centers, especially the thalamus and hypothalamus. It is upon these subcortical centers that the electrical phenomena of the cortex depend. An experiment with cats is reported, giving evidence of the shunting out of cortical responses when certain cerebral sections are made.

H. D. Sporer (Psychol. Abstr.).

The Effect of Muscular Exercise on the Serum Cholinesterase Level in Normal Adults and in Patients with Myasthenia Gravis. Stoner, H. B., and Wilson, A. [*J. Physiol.*, **102**, 1–4 (1943); *cf. Richter and Croft, C.A.*, **37**, 1492^5.]

The concentration of cholinesterase (I) was determined in the serum from 6 normal subjects and from 11 patients with myasthenia gravis, 9 of whom were under treatment with prostigmine. Samples of blood were taken from the antecubital vein before and after occlusion for four minutes, with and without exercise of the fingers and wrist. In none of the cases was there a significant change in the concentration of (I) as the result of exercise.

B. J. Jandorf (Chem. Abstr.).

The Physiological Effects of CO_2 on the Activity of the Central Nervous System in Man. Brazier, Mary A. B. [*Medicine*, **22**, 205–21 (1943).]

Special consideration is given to high-altitude flying. The influence of CO_2 on the central nervous system of man and on anoxia, as well as the mechanisms by which anoxia is combated by CO_2, is considered.

F. B. Seibert (Chem. Abstr.).

Correlation Between Sex and Chemical Constitution of the Human Brain. Wei, Arthur, and Liebert, Erich. [*Quart. Bull. Northwestern Med. School*, **17**, 117–20 (1943).]

The cephalin fraction of human brain tends to increase with age at the expense of other lipide fractions in both gray and white matter. Adult female brain contains more cephalin than male brain, while the male brain is relatively richer in lecithins, galactolipides and sphingomyelins. The lecithin and cephalin fractions of female brain are richer in P than the phospholipides of the male brain.

Dorothy A. Meyer (Chem. Abstr.).

The in vitro Oxidation of Pyruvic and α-Ketobutyric Acids by Ground Preparations of Pigeon Brain. The Effect of Inorganic Phosphate and Adenine Nucleotide. Long, C. [*Biochem. J.*, **37**, 215–25 (1943).]

For the anaerobic oxidation of pyruvate and α-ketobutyrate by ground pigeon brain preparations, with methylene blue as H-acceptor, either inorganic PO_4^{---} or arsenate is required. But whereas inorganic PO_4^{---} stimulates the O_2 consumption and the utilization of pyruvate or α-ketobutyrate by respiring brain preparations, arsenate has a slight inhibiting effect. Under comparable conditions, α-ketobutyrate is utilized equally well by minced or ground pigeon brain, but pyruvate is utilized more rapidly by ground than by minced tissue. This difference in behaviour is attributed to the adenine nucleotide traces in the preparations. Adenine nucleotide markedly increases the net O_2 uptake and pyruvate utilization by pigeon brain suspensions in the presence of PO_4^{---}; the oxidation of α-ketobutyrate is stimulated only occasionally. Normally the O_2/α-ketobutyrate ratio and the respiratory quotient for α-ketobutyrate oxidation is the same, whether brain suspensions or minced brain preparations are used. It is concluded that dialyzed brain suspensions, respiring in a phosphate-buffered inorganic medium, utilize pyruvic acid by oxidative decarboxylation and anaerobic dismutation, but in the presence of adenine nucleotide it undergoes an entirely different type of oxidation. For the part of pyruvate oxidation, which is catalyzed specifically by adenine nucleotide, the following data were obtained: O_2/pyruvate, 1·20; respiratory quotient, 1·50; gaseous CO_2/bicarbonate CO_2, 2·0. The second value (1·50) indicates that in the oxidation of 1 mole of pyruvic acid 1·8 moles of CO_2 are produced, or that 60 per cent. of pyruvic C is converted to CO_2. The last value (2·0) indicates that 2 moles fixed acid must also be produced, but the nature of the fixed acid is still unknown.

S. Morgulis (Chem. Abstr.).

Gangliosides, A New Group of Sugar-containing Brain Lipoids. Klenk, E. [*Z. physiol. Chem.*, **273**, 76–86 (1942); *cf. C.A.*, **38**, 6156[5]; **36**, 3204[3].]

Since lipoids containing neuraminic acid (I) are located mainly in the central nervous tissue, or, perhaps, exclusively in the ganglia, and are of a glucosidic nature, the name "gangliosides" (II) is proposed for them. The (II), along with cerebrosides and sphingomyelins, are components of the protagon fraction of brain tissue (*cf.* Blix, *C.A.*, **33**, 713[1]). (II) are water-soluble, non-dialyzable colloids, consisting of fatty acids (mainly stearic) 20, sphingosine or a similar base 13, (I) 21, and sugar (mainly galactose) 40–43 per cent.; small amounts of glucose were found. (II) are freed from alkali salts by solution in 15 volumes of basic Pb acetate, precipitation with 70 volumes of MeOH, suspending the precipitate in 25 volumes of MeOH and benzene (1 : 1), and decomposing the Pb salt with H_2S; yield, 85–90 per cent. of the original product. The main portion of cerebrosides is removed by extraction with hot EtOAc or by 95 per cent. alcohol. The phosphatides are removed by adsorption on Al_2O_3 from a hot pyridine solution (1 : 6). The filtrate is evaporated *in vacuo* and precipitated with a large amount of acetone[6]; yield, 8·8 gm. P-free substance, from 12 gm. of extract. For further purification the P-free material is dissolved in 15 volumes of glacial AcOH with heating, allowed to stand overnight and decanted. The precipitate is a mixture of cerebrosides and (II), constituting 30 per cent. of the P-free product; yield, 8·3 per cent. (I). The supernatant fluid contains (II), which are precipitated by acetone. The substance is dissolved in a minimum amount of $CHCl_3$ and alcohol, and, on dilution with hot alcohol, the $CHCl_3$ is removed by distillation. At 0° the pale yellow substance separates almost completely; yield is 60–70 per cent. of the P-free product. (II) is dried at 70° *in vacuo*; analysis corresponds to $C_{84}H_{118}N_2O_{26}$. (II) is practically insoluble in ether, acetone and AcOEt, difficultly soluble in EtOH, more readily soluble in MeOH, easily soluble in mixtures of benzene + alcohol, $CHCl_3$ + alcohol, pyridine and AcOH. Crystallized from hot alcohol it yields small spherolytic crystals, showing in polarized light a well-formed girder cross. It decomposes at 205° without melting. The aqueous solution reacts acid to litmus. With phenolphthalein it behaves as a monobasic acid, but the color change is very diffuse. The acid reaction indicates the presence of a free carboxyl group of (I). Fehling solution is not reduced by it. It does not contain free NH_2 groups. In pyridine solution the sp. rotation is $(\alpha^{20})D = -2{\cdot}79°$. Identification of the cleavage products (fat acids, sphingosine, galactose and glucose) is described in detail (*cf. C. A.*, **37**, 5743[7]). T. Laanes (Chem. Abstr.).

Distribution of Phosphatase in the Spinal Cord of Chick Embryos of One to Eight Days' Incubation. Moog, Florence. [*Proc. Natl. Acad. Sci. U.S.*, **29**, 176–83 (1943).]

Alkali phosphatase (I) and acid phosphatase (II) were determined in spinal cord sections by methods modified from those of Gomori (*C.A.*, **35**, 2915[3], 8053[2]). Both were found in fairly large amounts as early as the end of the first day of incubation. (I) usually reacted more strongly than (II). The histological distribution of (I) and (II) (determined at daily intervals) is given in detail. All nucleoli and nuclear membranes contain (I), but (II) is not found in nuclei. Both enzymes appear to be phosphomonoesterases of classes AI and AII of the Folley and Kay (*C.A.*, **30**, 5242[4]) classification. W. C. Tobie (Chem. Abstr.).

The Type of Cholinesterase Present in Brain Tissue. Mendel, Bruno, and Rudney, Harry. [*Science*, **98**, 201–2 (1943); *cf. C.A.*, **37**, 5427[6].]

Brain tissue of all vertebrates contains only true cholinesterase. No general statement on the type of cholinesterase in any other organ can be made. E. D. Walter (Chem. Abstr.).

Nerve Conduction as an Interaction in the Albumin Chain. Schmidt, Otto. [*Physik Z.*, **44**, 139–50 (1943).]

In an extension of previous work (*C.A.*, **37**, 2258[5]) on the "freedom" and interaction of B-electrons, Schmidt concludes that nerve conduction, which is a resonance of enol groups of the same kind, is directional. The exciting energy is conducted over long distances without significant diminution of intensity. Stimulation of both ends of a nerve leads to barriers. The temporary coefficient is that of a chemical reaction (enolization). Nerves can be blocked by "hydrogen binding." J. B. Austin (Chem. Abstr.).

The Significance of Adrenal-cortical Hormones in Psychiatry and Neurology. Klimmer, Rudolf. [*Allgem. Z. Psychiat.*, **121**, 324–34 (1943).]

A review. W. M. Sperry (Chem. Abstr.).

Biological Changes in Theiler's Virus of Spontaneous Mouse Encephalomyelitis. Jungeblut, Claus W. [*Am. J. Pub. Health*, **33**, 1227–43 (1943).]

In two of four experiments in which Theiler's virus of mouse encephalomyelitis was transmitted to cotton rats—with subsequent serial subpassage in the latter animals—the virus became fixed in the new host and acquired new biological properties. These properties were reflected (*a*) by a marked increase in peripheral invasiveness for albino mice and cotton rats, and (*b*) by the ability to induce various types of central nervous system involvement in guinea-pigs. Evidence is adduced to show that the cotton rat variant was serologically identical with the parent virus. J. A. Kennedy (Chem. Abstr.).

Probable Mechanism by which Somatic Changes in Certain Emotional States are Mediated. Milhorat, A. T., et al. [*Proc. Soc. exp. Biol. N.Y.*, **53**, 23–5 (1943).]

A loop of intestine from adult rabbit was suspended in physiological solution, attached to a recording lever so that its contractions could be recorded. Blood from agitated psychiatric patients was added to the solution. Blood from normal individuals served as control. The blood from the patients altered the rhythmic contractions of muscle and reduced the amplitude of contractions because of incomplete relaxation. These were not the simple effects from using adrenalin, and the nature of the substance producing the result is unknown.

H. PEAK (Psychol. Abstr.).

The Bi-sexuality of Man. Myerson, A., and Neustadt, R. [*J. Mt. Sinai Hosp. N.Y.*, **9**, 668–78 (1942).]

Through the presentation of case-material the authors discuss five types of homosexual conduct: (1) The polymorphous group, where the individual becomes a homosexual when excluded from heterosexual conduct, e.g. in jail; (2) the passively homosexual group (adynamic sexuality), those sought out by active homosexuals and finding social pleasure and possibly profit in the relationship; (3) heterosexuality followed by exclusive homosexuality, shift in sexual personality rather than a transitory experimental phase; (4) true male homosexuals, homosexual in drive, conduct and fantasy; and (5) the paradoxical group, essentially impotent or without drive, but without true male homosexuality. The authors describe a method whereby the ratio of androgens and estrogens is analyzed in ratio between male and female hormones. For each case presented the hormone findings are given. Although the chemical tests are crude, there nevertheless remain important clinical correlations between the sexual constitution of a male and the hormonal values established by the examination of his urine for androgens and estrogens.

A. WEIDER (Psychol. Abstr.).

Age and Reorganization of Central Nervous System. Kennard, M. A., and Fulton, J. F. [*J. Mt. Sinai Hosp. N.Y.*, **9**, 594–606 (1942).]

A comparison of motor performance, made before and after ablations from the central nervous system in both adult and infant monkeys and chimpanzees for the past six years, yielded the following results: "(1) In monkeys and chimpanzees the factor of age affects directly the amount of recovery of motor functions which follows ablations of the motor areas of the cortex; (2) other areas of cortex reorganize to some degree to integrate motor function in the absence of the motor areas, at any age; (3) there is little restitution of function if operations are made after the second year of life, and only during the first six months of life is it sufficient to produce function adequate for the existence of the animal; (4) the basal ganglia function at birth and continue to show similar functions throughout life; (5) after removal of the frontal association areas, 9–12, and the occipital areas, the remaining cortex shows no such capacity for reorganization of motor function; (6) the sensory motor cortex may be considered therefore as a unit within which there is much less specificity of function in the infant than in the adult; (7) the capacity for reorganization in the absence of specificity may be considered at the present time as due either to functional or anatomical changes."

A. WEIDER (Psychol Abstr.).

A Physiological Theory of Colour Perception. Granit, R. [*Nature, Lond.*, **151**, 11–14 (1943).]

Using the micro-electrode technique of measuring single fiber discharge, two types of individual spectral sensitivity curves for receptors were found: (1) "Broad absorption bands, here called *dominators*; and (2) narrow bands, here called *modulators*." The theory proposes that the dominant type, which is the more frequent, is responsible for the sensation of brightness. The narrow modulator bands, which are found in three preferential regions around 580–600 mμ., 520–540 mμ., and 450–470 mμ., modulate the dominant impression of brightness to color. The theory is evaluated in terms of other experimental data.

C. G. MUELLER (Psychol. Abstr.).

Intellectual Symptoms in Temporal Lobe Lesions Including "Déjà pensée." Brickner, R. M., and Stein, A. [*J. Mt. Sinai Hosp. N.Y.*, **9**, 344–8 (1942).]

"Two cases are described in which 'forced thought' was a manifestation of a temporal lobe lesion. In one of the cases there was a feeling of familiarity for the forced thoughts (déjà pensée)." The "dreamy state" is broken down into (1) the déjà phenomenon and the feeling of strangeness, (2) panoramic memory or fragments of it. A theory of their genesis is presented which suggests a hitherto unreported neurophysiological function of the temporal cortex.

A. WEIDER (Psychol. Abstr.).

Course and Prognosis in the Psychoneuroses. Malamud, W., and Gottlieb, J. S. [*J. Mt. Sinai Hosp. N.Y.*, **9**, 630–9, (1942).]

341 cases of psychoneurosis, admitted to the Iowa State Psychopathic Hospital during the years 1929–1937 inclusive, were subjected to a follow-up study during the year 1939. The studies made of these patients during their stay in the hospital were reviewed in terms of the clinical picture they presented, their life-history and their treatment and course in the hospital. It was found that in the two largest groups (hysterias and mixed neuroses) certain factors stood out as useful prognostic criteria. I.Qs. above 90 on the Binet and duration of the disease of one

year or less before admission to the hospital were found more frequently in the cases that recovered than in those who showed no improvement. The authors describe a treatment (deep exploration) which resulted in the most frequent recoveries. In the hysterias, asthenic physical build and gradual onset were most often found in the unimproved cases. The mixed neuroses showed higher age-levels and a shorter stay in the hospital among the unimproved patients.

A. WEIDER (Psychol. Abstr.).

2. Pharmacology and Treatment.

Influence of Various Drugs on the Threshold for Electrical Convulsions. Tainter, M. L., Tainter, E. G., Lawrence, W. S., Neuru, E. N., Lackey, R. W., Luduena, F. P., Kirtland, H. B., jun., and Gonzales, R. I. [*J. Pharmacol.*, **79**, 42–54 (1943).]

An electrical device is described for measuring the convulsive threshold of unanesthetized rabbits, with a high resistance stimulator and 60-cycle current. Barbital compounds, dilantin, 3-methyl-5,5-phenylethylhydantoin and propazone, raised the convulsive thresholds generally proportional to the dose. The different barbitals showed little difference in potency for equivalent doses. Marked depression of excitability was produced by bromides, chloral, EtOH, propylene glycol, paraldehyde and tribromoethanol. Morphine, 10–15 mgm. per kgm., did not change the threshold. Acetylsalicylic acid caused no change; large doses of acetophenetidine and acetanilide raised the threshold. The analeptic drugs strychnine, metrazole, coramine and caffeine were irregular in their effects; this indicates a lack of specificity for this phase of cerebral function. Picrotoxin lowered the threshold. Cocaine, mescaline and the sympathomimetic amines raised the threshold to a moderate degree. Thyroxine lowered the threshold to epileptiform convulsions more than any other agent tested. This effect suggests a possible physiological basis for the impaired neuro-muscular control and poor poise of clinical hyperthyroidism.

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

Changes in Blood Pigment Produced by Narcotics. Jung, Fritz. [*Arch. exptl. Path. Pharmakol.*, **201**, 210–12 (1943).]

Contrary to Ellinger and Rost (*C.A.*, **17**, 2009) no methemoglobin is produced in the blood of cats by prolonged anesthesia with Et_2O or $CHCl_3$.

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

The Influence of Amphetamine (Benzedrine) Sulfate, d-Desoxyephedrine Hydrochloride (Pervitin) and Caffeine upon Work Output and Recovery when Rapidly Exhausting Work is Done by Trained Subjects. Foltz, E. E., Ivy, A. C., and Barborka, C. J. [*J. Lab. clin. Med.*, **28**, 603–6 (1943).]

Four students, trained on the bicycle ergometer, were given one of the above drugs or a placebo intravenously before a double work period. Amphetamine did not affect the output, but pervitin and caffeine increased it in the unfatigued subject. Neither amphetamine nor pervitin enhanced the rate of recovery in the fatigued subject, but caffeine did so. In some instances the drugs definitely improved feeling-tone. Stimulants should be chosen according to whether the purpose is to increase the output of unfatigued persons or to enhance recovery of the fatigues. The foregoing findings pertain only to rapidly exhausting work.

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

The Influence of Benzedrine on Work-decrement and Patellar Reflex. Alles, G. A., and Feigen, G. A. [*Amer. J. Physiol.*, **136**, 392–400 (1942).]

Doses of 10, 20 or 40 mgm. of benzedrine sulphate inhibit voluntary muscular fatigue and may abolish complete muscular fatigue maintained by repeated work trials. The effect is related in degree and time with the effects of benzedrine on the patellar reflex, and it is probably indicative of action directly on the central nervous system. The effect is more marked than that observed with ten times as much caffeine.

R. L. SOLOMON (Psychol. Abstr.).

The Influence of Amphetamine (Benzedrine) Sulfate and Caffeine on the Performance of Rapidly Exhausting Work by Untrained Subjects. Foltz, E. E., Schiffrin, M. J., and Ivy, A. C. [*J. Lab. clin. Med.*, **28**, 601–3 (1943).]

Twenty-three male subjects were given a capsule of benzedrine, caffeine, or a placebo one hour before a test consisting of stepping up and down while carrying a knapsack loaded to one-third of the body-weight. The drugs produced no evident effect except a euphoria, making the subject feel that he "was doing a lot of work." This type of test, however, is inadequate to determine the effect of the drugs on work output, since the influence of training overshadowed a possible pharmacological effect.

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

Effect of Amphetamine (Benzedrine) Sulfate upon Higher Nervous Activity. Alpern, E. Bryce, Finkelstein, Nathaniel, and Grantt, W. Horsley. [*Bull. Johns Hopkins Hosp.*, **73**, 287–99 (1943).]

Oral administration of amphetamine sulfate to four dogs (1 mgm./kgm.) caused marked loss of differentiation in the conditioned reflexes—secretory, motor and autonomic. There was an increase in the conditioned secretion to food, the latent period of conditioned secretory responses was shortened, while that of conditioned motor defense reflexes was unaltered or lengthened.

The unconditioned secretion to food and sexual reflexes were decreased. The effects are observed after a half-hour, reach a maximum in 1–2 hours, and can still be detected six hours after administration of the drug. ZELMA BAKER MILLER (Chem. Abstr.).

Modern Stimulants of the Nervous System (Benzedrine). Ginetsinskii, A. G., Barbashova, Z. I., and Shamarina, N. M. [*Advances in Modern Biol. (U.S.S.R.)*, **16**, 113–26 (1943).]

A review of benzedrine covering the relation between chemical structure and physiological effects of related amines, pharmacodynamics, toxicology and clinical applications.
G. M. KOSOLAPOFF (Chem. Abstr.).

Severe Injury to the Kidneys and Brain following Sulfathiazole Administration: Levels and Persistent Cerebral Damage. Luetscher, John A., jun., and Blackman, Sam. S., jun. [*Ann. Internal Med.*, **18**, 741–56 (1943).]

Five cases of sulfathiazole reaction (three severe and two probable) were studied. All developed an unusual increase in serum Na and chlorides. In two fatal cases there were symptoms of cerebral injury, and areas of edema and gliosis were found in the cerebrum at autopsy.
JOHN T. MEYERS (Chem. Abstr.).

Peripheral Nervous Symptoms in Treatment with Sulfonamides and Related Drugs. Nyman, Ebbe. [*Nord. Med.*, **12**, 861–2 (1942); *Chem. Zentr.*, **11**, 807 (1942).]

The Me groups of various sulfonamides, especially sulfamethylthiazole, are discussed with regard to their possible neurotropic action, and analogies with the curare alkaloids and the quarternary ammonium bases are pointed out. L. E. GILSON (Chem. Abstr.).

Sedormid (Allylisopropylacetylcarbamide) Intoxication. Funk, Erich. [*Z. psych. Hyg.*, **15**, 43–66 (1942).]

Several cases of chronic intoxication with severe psychotic manifestations, due to the excessive use of sedormid, are described. WARREN M. SPERRY (Chem. Abstr.).

The Diagnostic Value of the Rapid Detection of Barbiturates in the Urine in Cases of Poisoning. Denis, X., and Lambrechts, A. [*Rev. belge sci. méd.*, **12**, 247–53 (1940); *Chem. Zentr.*, **1**, 2693 (1941).]

A method is described by which it is possible to detect the presence of 0·2 mgm. of barbituric acid in 20 c.c. of urine. The method depends on the ether extraction of the urine absorbed in a mass of Na_2SO_4 and the subsequent detection of the barbituric acid colorimetrically by treatment of the ether extract with CO $(NO_3)_2$ and Et_2NH. M. G. MOORE (Chem. Abstr.).

Effect on the Fetus of Pentobarbital-sodium and Pentothal-sodium. Dreisbach, Robert, and Snyder, Franklin F. [*J. Pharmacol.*, **78**, 250–8 (1943).]

The drugs were injected into the maternal ear vein and the respiratory movements of the full-term rabbit fetuses observed through the uterus wall, exposed by laparotomy under the surface of a saline bath. Pentobarbital-Na, 5–10 mgm./kgm., decreased the respiratory rate of the fetuses for less than 15 minutes; 20 mgm./kgm. decreased it to about one-third normal for 30 minutes without producing any marked analgesia in the maternal animal; and 30 mgm./kgm. deeply depressed or abolished fetal respiration for the duration of the experiment. Pentothal-Na, 10 mgm./kgm., had no marked analgesic effect on the maternal animal, and decreased fetal respiration to one-third normal for about 5 minutes. Repeated doses, totalling 30–35 mgm./kgm., had relatively little cumulative effect on the fetuses. Fetal apnea after injection of pentothal-Na was caused by the drug and was not due to anoxemia, since analysis of the fetal blood showed that oxygenation and the CO_2 content remained normal.
L. E. GILSON (Chem. Abstr.).

A Possible Method for the Determination of Prolonged Action of Barbiturates. Cole, Versa V. [*J. Pharmacol.*, **78**, 170–3 (1943).]

Rats were given Na pentobarbital. Several hours after all signs of narcosis had disappeared the rats were still protected by the barbiturate against death from strychnine or picrotoxin. In another experiment Na phenobarbital was found to be more effective against death from strychnine when given 22 hours before the strychnine than when given only 20 minutes before the latter. Na phenobarbital was equally effective against death from picrotoxin whether given 20 minutes or 22 hours before the picrotoxin. L. E. GILSON (Chem. Abstr.).

Different Effects of Coramine and Metrazole on the Body Temperature of the Rabbit. Hahn, Fritz. [*Klin. Wochenschr.*, **21**, 460–1 (1942).]

The body temperature of the rabbit is lowered by metrazole and raised by coramine. In order to demonstrate these effects distinctly, half of the subcutaneous convulsive dose is required (18 mgm. metrazole/kgm. or 150 mgm. coramine/kgm.). Regular changes of 1–2° (and more in exceptional cases) are obtained only with 60–80 per cent. of the convulsive dose. When coramine is given in doses which raise the temperature, distinct muscle tremors occur; these doubtless

liberate large amounts of heat in the body. They do not occur with metrazole. There is nothing to indicate opposite effects of these two substances on the sympathetic nervous system.
RUTH BERGGREN (Chem. Abstr.).

The Bases and Results of Electric Shock Therapy; The Pathogenesis of the Psychoses. Ewald, G., and Haddenbrock, S. [*Z. ges. Neurol. Psychiat.*, **174**, 635–69 (1942).]
The blood sugar (I) concentration increases by 30–40 mgm. per cent. after electric shock convulsions, reaching the maximum at about 10 minutes and returning slowly to normal at about one hour. A larger rise (55 mgm. per cent.) in (I) follows metrazole convulsions and the hyperglycemia is maintained for a longer time. The increase in (I) is not due to a mobilization of muscle glycogen, because a rise of 20 mgm. per cent. occurred in cases of abortive electric shock therapy in which no convulsive muscular contractions occurred.
WARREN M. SPERRY (Chem. Abstr.).

The Conditioned Reflex Treatment of Alcoholism. Lake, C. B. [*Welf. Bull. Ill. St. Dep. Publ. Welf.*, **34**, 2 (1943).]
Although not a radical method, the conditioned reflex treatment is the most effective way of laying a foundation in the form of a temporary aversion to intoxicants and of starting the alcoholic on a rational program of sobriety and self-sufficiency. The treatment, which requires a 3-day hospitalization, consists of injections of an emetic followed by sedation. During convalescence massive doses of vitamin B are given and office consultations are continued for some time. The treatment succeeds only when the patient genuinely wants to recover.
M. E. MORSE (Psychol. Abstr.).

The Effect of Vitamin E Therapy on the Central Nervous System in Amyotrophic Lateral Sclerosis. Davison, Charles. [*Bull. N.Y. Acad. Med.*, **19**, 386–416 (1943).]
Ten cases of amyotrophic lateral sclerosis were treated with α-tocopherol and vitamin E. The clinical response was *nil*, but in six cases destruction of the myelin sheaths and axis cylinders was less intense than that observed in untreated cases. G. H. W. LUCAS (Chem. Abstr.).

Action of Ephedrine in Myasthenia Gravis. Burn, J. H. [*Schweiz. med. Wochschr.*, **71**, 1196–7 (1941); *Chem. Zentr.*, **11**, 67 (1942).]
The therapeutic benefit of ephedrine in myasthenia gravis as determined by experimental studies is based (1) on improvement of inhibited neuromuscular synapses, and (2) upon augmentation of the like action of the circulating adrenaline and of the sympathetic impulse.
MAURICE M. RATH (Chem. Abstr.).

The Course of the Serologic Tests during Therapeutic Malaria in Patients with Syphilis. Kaplan, Bernard I., and Brightman, I. Jay. [*Am. J. Pub. Health*, **33**, 1073–82 (1943).]
Changes in quantitative serologic tests in syphilitic individuals during the course of therapeutic malaria depend upon the type of test employed and the species of parasite used. During infection induced by inoculation with *Plasmodium malariae* there was a uniform fall in the New York State complement-fixation titer and a preliminary rise and subsequent fall in the Kahn and New York State titers. During infection induced by inoculation with *Plasmodium vivax* the serologic changes were most often similar but were not so constant. Fever alone did not seem to be a major factor in the production of the serologic changes. No conclusions are warranted regarding any relationship between the changes in serologic titers and potential therapeutic results.
J. A. KENNEDY (Chem. Abstr.).

he Treatment of Post-encephalitis Parkonsonism with Belladonna Root (Bulgarian Cure). Lehoczky, T. v. [*Deut. Z. Nervenheilk.*, **154**, 242–71 (1943).]
Various preparations of belladonna root (I) were used in the treatment of 160 patients, of whom 84 were definitely, 43 somewhat, and 26 a little improved; 5 were unchanged and 2 died. (I) is a valuable therapeutic agent in Parkinson's disease.
WARREN M. SPERRY (Chem. Abstr.).

The Action of Benzol on Certain Central Nervous Regulating Mechanisms. Guerra Perez-Carral, F. [*J. Pharmacol.*, **77**, 336–42 (1943).]
The effects of inhalation of benzol on certain sympathetic reactions and temperature regulation, together with the characteristic shivering and panting, were studied in rabbits and dogs. The findings indicate that benzol has a specific central action on a zone of integration for these reflexes, influenced through the hypothalamus.
M. E. MORSE (Psychol. Abstr.).

OBITUARY.

Lt.-Col. BANARSI DAS.

Lieut.-Col. Banarsi Das, late Chairman of the Indian Division, Royal Medico-Psychological Association, died at his residence in Agra on December 19, 1943. Colonel Das had been in failing health for some time, and had actually tendered his resignation of the Chairmanship of the Division in November, 1943.

Born on May 11, 1888, he took the M.B., B.S. of the Punjab University in 1911, and after serving in the Provincial Medical Service of the United Provinces from 1911 till 1929 he was deputed to England to study Psychiatry. He received the D.P.M.Eng. in 1930, and in 1931 he made a tour of mental hospitals in the United Kingdom and the Continent of Europe. He was appointed Superintendent of the Mental Hospital, Agra, in succession to the late Lieut.-Col. Overbeck-Wright, I.M.S., and continued in this appointment until his retirement in February, 1943. It was largely due to the energy of Colonel Das that the Indian Division of the Royal Medico-Psychological Association was formed. He became its first Secretary in 1939, and Chairman in 1942, on the retirement of Lt.-Col. C. Lodge Patch, I.M.S. In 1942, in virtue of his work as an honorary psychiatrist to the army, he was granted the honorary rank of Lieutenant-Colonel.

LT.-COL. BANARSI DAS, M.B., B.S.PUNJAB, D.P.M.

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Part I.—Original Articles.

CRIME, SENESCENCE AND SENILITY

By W. NORWOOD EAST, M.D., F.R.C.P.
Special Consultant to the Royal Navy; formerly H.M. Commissioner of Prisons, etc.

IN recent years authoritative opinion in this country has decided that aged persons are less suited for magisterial duties in a juvenile court than justices who are younger.

In 1927 the Departmental Committee on the Treatment of Young Offenders reported that: "Most Magistrates are not appointed until they have reached middle age, but the service of the juvenile court demands younger recruits, and special attention should accordingly be paid to considerations of age." In 1935 the late Lord Hewart, when Lord Chief Justice of England, approached the subject circumspectly in the Second Clarke Hall Lecture. He said: "Is it not desirable that magistrates in these juvenile courts should be of parental age, varying from forty to sixty, rather than of the grandfatherly period that runs from sixty to a happily distant future?" A Home Office Circular, in 1936, was more emphatic and declared that: "Apart from the obvious advantages attaching to quickness of hearing and of sight in a justice, there is the fact that as time goes on men and women justices are apt to lose the freshness of mind and sympathy and the up-to-date knowledge of social conditions which are of extreme importance for successful work in the juvenile courts. Where it is a choice between two otherwise equally good candidates for the panel much, or indeed everything, is to be said for selecting the younger of the two."

These views recall the fact that intellectual and emotional contacts are often most fruitful among contemporaries, and understanding between the offender and his judge is most likely to be established when the experiences, temptations and hazards of the one are not too remote from those of the other. They also suggest that the younger magistrates may not be the best fitted in some respects to adjudicate when aged persons commit offences, since few have expert knowledge of the problems and mental functioning of elderly persons, and few have time or inclination to study the matter. Moreover, contacts with aged relatives and acquaintances often provide only a restricted and sometimes biased estimate of the mental background of the sexagenarian in our midst. For, even if we accept the view that the psychological mechanisms of childhood and senescence often differ little from one another, the medical and social settings of the two extreme periods of life are widely dissimilar. It is also necessary to recognize the fact that senescents are as much individualized as persons at other ages, and that their emotional lives sometimes receive less consideration from others than they deserve.

For obvious reasons the trial of aged persons by their contemporaries may be unsatisfactory, and since age itself is not necessarily a true measure of senescence or senility, using the word senescence for the normal process of growing old, and senility for the abnormal mental states which sometimes supervene towards the close of life, it seems worth while to consider a little the manner of thought and behaviour of the aged.

The subject is of more than academic importance. Prof. Bowley, calculating the population of Great Britain on the hypothesis that the annual number of births is the same as in 1921–23, the death-rates are the same as in 1910–12, and that there is no emigration, assesses the percentage of the population aged 65 and over as 6 in the year 1921, 7 in 1931, 8½ in 1941, 9 in 1951, and 10½ in 1971, 1991 and 2011. He estimates the percentage of the population aged 15 to 65 during the same years at 66, 68, 67, 67, 66, 66, 66, so that the future wage-earners will have to support an increasingly large number of non-effectives over the age of 65. It has been suggested, elsewhere, that by the year 1961, the number of persons of pensionable age (65 in men and 60 in women) will be over 8,000,000, or 1 in 6 of the population, whereas at the beginning of the century it was 1 in 17.* Williams, Quesnel, Fish and Goodman state that the number of persons over 65 years of age in the population of the United States of America has shown an increase of 35 per cent. in the decade 1930–1940.

The size of the problem of criminality in aged persons to-day is also important. During the ten-year period 1929–38 there were 13,937 persons aged 60 and over who were found guilty of indictable offences at assizes, quarter sessions and courts of summary jurisdiction (Table I). Of these, 11,430 were males and 2,507 were females. This not inconsiderable total is smaller than the totals at other age-periods given in the Criminal Statistics and abstracted in Table I without separating the sexes. The figures accord with the well-known fact that the incidence of crime per 100,000 of the population of the age or age-groups consistently decreases after thirteen as age advances. The figures are only approximate and do not, and cannot, serve as exact guides to the ages of the offenders responsible for the total volume of crime known to have been committed, since some offenders are never caught, and others, especially the rather older and more experienced, commit whole series of offences, but only figure once in the tables of personal particulars. On the other hand, the same offender may commit more than one offence in the same year and figure more than once in the number for that period.

The figures in Tables I and II do not include the large number of offenders who were found guilty of non-indictable offences in courts of summary jurisdiction. The Annual Reports of the Prison Commissioners, however, show in relation thereto that in the years 1929–38 of 4,689 males of all ages convicted and imprisoned for indecent exposure, 381, or 8 per cent., were 60 years of age and over, and that of 48,710 males of all ages convicted and imprisoned for offences against the Intoxicating Liquor Laws—drunkenness—8,001, or 16 per cent., were 60 years of age and over. In a recent study Arieff and Rotman found in 100 unselected cases of indecent exposure from the Municipal Psychiatric Institute at Chicago, 6 men were of the age 61–90.

TABLE I.—*Total Persons Convicted of Indictable Offences, including those against whom Charges were Proved and Orders made without Conviction.*

Year.	Total found guilty.	Number of persons at different ages.						
		Under 14.	14–21.	21–30.	30–40.	40–50.	50–60.	60 and over.
1929	53,322	6,380	15,226	13,529	9,159	5,321	2,436	1,271
1930	56,766	6,863	17,061	13,989	9,374	5,526	2,607	1,346
1931	59,366	7,587	17,386	14,761	10,075	5,694	2,569	1,294
1932	64,958	9,014	18,875	16,481	10,746	5,696	2,777	1,369
1933	62,660	9,743	17,176	15,576	10,574	5,573	2,644	1,374
1934	65,736	11,645	18,403	15,344	10,561	5,589	2,827	1,367
1935	69,849	13,873	20,637	15,199	10,508	5,571	2,640	1,421
1936	72,785	14,459	21,681	15,467	11,143	5,806	2,803	1,426
1937	77,529	16,413	23,080	15,974	11,551	6,024	2,967	1,520
1938	78,463	15,559	24,008	16,392	11,929	6,063	2,963	1,549
Totals	661,434	111,536	193,533	152,712	105,620	56,863	27,233	13,937

A marked reduction in the crime rates of elderly persons is not peculiar to Britain. Van Vechten has recently given the following commitment rates per 10,000 male persons in the United States of America: at all ages, native-white 11, foreign

* Art., "Old Age," *The Times*, February, 25, 1944.

born 5; at age-period 60–69, native white, 1·8, foreign born 1·4; at age-period 70 and over, native-white 0·7, foreign born 0·4.

The Criminal Statistics of England and Wales are not immediately concerned with the medical aspects of crime, and the age-grouping above the age of 20 is set out in decades, the oldest group being "60 and over." Nevertheless, looked at broadly, certain features of interest appear from a consideration of the figures in Table II, although the official list of felonies and misdemeanours referred to in the Criminal Statistics are not given in detail. For the purpose of this study, the offences are considered in groups A, B and C of Table II according to the main instinctive activity which appears to be related to the crime. Other offences are not dealt with in this table, as they bear little relation to each other. At the same time the defects of this manner of classification must be admitted since, for example, murder or theft may be due to the aggressive, sexual, acquisitive or parental instincts.

TABLE II.—*Number of Persons Found Guilty of Certain Indictable Offences, 1929–1938.*

Offence.	Under 60.	60 and over.
A. *Acquisitive Offences and (in brackets) place in group.*		
Burglary	3,340 (4)	64 (4)
Housebreaking	9,064 (3)	132 (2)
Shopbreaking	16,862 (2)	112 (3)
Attempt to break and enter houses, etc.	1,008 (7)	16 (7)
Entering to commit a felony	2,763 (5)	57 (5)
Possession of housebreaking tools	1,444 (6)	35 (6)
Robbery	736 (8)	1 (8)
Larceny, embezzlement, forgery, fraud, receiving, coining, etc.	532,979 (1)	10,896 (1)
Totals	558,196	11,313
B. *Sexual Offences and (in brackets) place in group.*		
Unnatural offences	316 (9)	19 (9)
Attempt to commit unnatural offences	471 (8)	35 (7)
Attempts to commit unnatural offences on males under 16	1,675 (3)	133 (2)
Indecency with males	861 (6)	68 (3)
Rape	272 (10)	8 (10)
Indecent assaults on females	895 (5)	56 (5)
" " " under 16	6,960 (1)	848 (1)
Defilement of girls under 13 to 16	1,534 (4)	58 (4)
Incest	494 (7)	27 (8)
Procuration	96 (11)	2 (11)
Abduction	41 (12)	—
Bigamy	2,524 (2)	44 (6)
Totals	16,139	1,298
C. *Aggressive Offences and (in brackets) place in group.*		
Murder	179 (6)	10 (5)
Attempt to murder	113 (7)	10 (5)
Manslaughter	456 (4)	18 (4)
Infanticide	111 (8)	—
Felonious wounding	708 (3)	29 (3)
Malicious "	9,252 (1)	409 (2)
Assault	376 (5)	12 (7)
Attempt to commit suicide	4,895 (2)	554 (1)
Totals	16,090	1,042

Table II shows that the frequency of the acquisitive, sexual and aggressive offences occur in this order in offenders under, as well as in those over, 60 years of age. Table IIA shows that the frequency with which the different acquisitive offences occur in persons under and over 60 are the same in the two groups, except that in persons over 60 housebreaking is more frequent than shopbreaking. Many

factors enter into the matter, and the change of position may be associated with the fact that as age advances enterprise and audacity tend to decrease.

At the same time it must be acknowledged that stereotyped patterns of behaviour exercise an important influence on the lives of many, so that, for example, the earning of money at first undertaken for a particular reason becomes so firmly established that the desire to accumulate wealth continues long after its original purpose has been achieved. Acquisitiveness also seems to be strengthened in persons who estimate their social value by the extent of their riches and not by what they have done to benefit society. This idea may persist even when their position and treasures have been illegally obtained, and their value to the State is no greater than that of any other fraudulent criminal. Arrogance of this sort is sometimes found in aged persons who are convicted of fraud and other acquisitive offences, and appears to be more a habit of mind than a temporary defensive reaction.

Cameron reminds us that in the nineteenth century there was a fairly widely held belief to the effect that an active sexuality was associated with probable longevity, and that recent animal experimentation has not tended to support this view. In the sexual offence group, Table III, the relative positions of bigamy and indecency with males in the two age-groups are, perhaps, not without significance. It may be that the lessened wage-earning capacity of the aged offender minimizes his opportunities, and his waning physical powers reduce his desire to commit bigamy. So, too, the relative frequency of indecency with males committed by men over 60 may indicate their unattractiveness for the average woman, and express a regression to an earlier stage of sexual development. Sexual offences in aged men are often due to the fact that phantasy and desire have outlived potency. It is notorious that in these cases sexual satisfaction may be obtained by indecent exposure, or by offences against children, and occasionally by such indirect methods as sending indecent letters through the post. Ruskin found an increased tendency toward committing such offences as exhibitionism and paedophilia by seniles and arteriosclerotics to an extent which comprised 60 per cent. of the total offences of psychotics of this group. A further matter of practical importance is the fact that offences often tend to occur in a comparatively early stage of mental deterioration, and must be differentiated from those which are due to the continuance of a long-established habit into old age.

Diethelm and Rockwell note that sexual desires which have been under control or repressed during adult life seem to become stirred up and threaten security in many people during the fifth decade. They found that the patients over 45 years of age who were admitted to a psychiatric clinic and presented sexual psychopathology had shown a greater or lesser degree of it during adult life. Among ambulatory patients who suffered from a minor psychopathological disorder, these authors found that sexual tendencies which were either accepted or controlled by the individual and which were not of pathological intensity might increase in intensity in the fifth decade, and became a source of annoyance or worry.

Moore refers to the studies of Lange, Rössle, and Hammond. Those of Lange indicate the fact that about half of the married men not older than 25 or 30 years, when a bilateral orchidectomy is done, continue to have a normal libido and potency. Rössle states that, in a series of 125 men, castrated under the German law for criminal sex offences, libido was weakened in approximately one-half of the cases. In seven men studied by Hammond castration after sexual maturity did not abolish libido. Moore concludes that the evidence suggests that in men in whom the psychic and neuromotor behaviour patterns of sexual activity have been established, complete loss of the testes does not necessarily prevent participation in sexual activity.

In the group of aggressive offenders (Table IIc) attempts at suicide occupy the first position in persons over 60. This accords with the fact that depressive thoughts are often in the forefront of the minds of the aged, and attempts at suicide occur in spite of knowledge that natural death will shortly accomplish the same purpose.

The Criminal Statistics for 1928 give the number in age-groups of persons over 16 convicted of murder in the quarter century 1904–28. They are given in Table III. The figures for women are complicated by the fact that after 1922 juries were able to return a verdict of infanticide instead of murder, and are ready to return special

TABLE III.—*Age at Time of Murder.*

A. *Men and Youths.*

Years.	Age-groups and (in brackets) percentage of total. 16–21.	21–30.	30–40.	40–50.	50–60.	Over 60.	Total.
1904–1908	13	42	31	21	11	4	122
1909–1913	8	49	35	21	9	3	125
1914–1918	4	25	18	15	12	4	78
1919–1923	9	38	26	17	16	3	109
1924–1928	9	50	24	16	7	1	107
Totals	43 (8)	204 (38)	134 (25)	90 (16)	55 (10)	15 (3)	541

B. *Women and Girls.*

1904–1908	1	6	1	1	—	1	10
1909–1913	1	11	3	2	1	—	18
1914–1918	1	11	4	1	1	1	19
1919–1923	5	21	6	2	—	—	34
1924–1928	20	35	11	2	—	—	68
Totals	28 (19)	84 (56)	25 (17)	8 (5)	2 (1+)	2 (1+)	149

findings or verdicts of insanity in favour of an accused woman. But both sets of figures reflect the moderating influence of time on crimes of passion.

Figures from Broadmoor Criminal Lunatic Asylum (Table IV), kindly supplied by Dr. J. S. Hopwood, show that the proportion of homicides over the age of 60 compared with those under 60 is in round numbers 1 to 14. The proportion among sane murderers is 1 to 18 (Table IIc).

E. Frankel found the percentage commitment rates by nativity and age in 1,000 murderers committed to the New Jersey State Prison also showed a small proportion of homicides in the older age-groups, whether native white, foreign born or negro :

	Under 20.	20–24.	25–29.	30–34.	35–39.	40–44.	45–49.	50–54.	55–59.	60–64.	65 and over.
Native white	13·1	25·6	23·8	12·8	8·7	4·7	4·4	1·6	2·5	2·2	0·6
Foreign born	3·4	14·9	17·8	19·3	15·1	11·0	6·5	5·2	3·1	2·4	1·3
Negro	8·1	16·8	18·2	20·2	14·5	9·4	5·4	5·4	1·0	0·3	0·7

The Criminal Statistics for 1928 considered the incidence of crime by age in the years 1911 and 1928. The age-groups of males over 60 in 1928, the youngest of whom were aged 46 in 1914 when the first Great War began, suffered relatively

TABLE IV.—*Offences and Ages of Admission to Broadmoor April 1, 1923–March 31, 1943.*

Offences.	Age-groups (M. = males, F. = females). 15 and under.		16–19.		20–29.		30–39.		40–49.		50–59.		60–69.		70 and over.		Total.
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	
Murder	—	1	16	2	86	58	119	93	55	33	39	10	22	4	9	1	548
Attempted murder	2	—	2	—	30	5	33	10	32	9	23	2	13	1	2	—	164
Manslaughter	—	—	1	—	4	—	4	2	3	—	1	—	—	—	1	—	16
Wounding	—	—	2	—	21	1	33	3	14	3	20	2	9	—	3	—	111
Sexual	—	—	2	—	12	—	16	—	11	—	6	—	1	—	2	—	50
Acquisitive	—	—	2	—	45	2	73	3	36	1	21	—	5	1	3	—	192
Arson	—	—	3	—	6	—	14	2	13	1	3	—	1	—	—	—	43
Other offences	—	1	—	2	4	—	13	4	8	1	6	1	6	—	1	—	47
Totals	2	2	28	4	208	66	305	117	172	48	119	15	57	6	21	1	912 males, 259 females
Grand totals	4		32		274		422		220		134		63		22		1,171

very little from war losses, and benefited from the prolongation of life which is so conspicuous a feature to-day. The group numbered nearly 600,000 more in 1928 than in 1911, yet the convictions for indictable offences fell from 1,009 to 709, and the incidence per million fell 52 per cent. This great reduction must indicate some decrease in crime. The incidence of convictions per million living males in the various groups was as follows:

The elderly, aged	Over 60	percentage fall	52
	50–60	,,	31
Men of war age	40–50	,,	30
	30–40	,,	22
Between war age in 1914–1918	21–30	,,	18
	16–21	,,	22

The general inference appeared to be that the elderly profited most, morally and materially, by generally improved social conditions, and in particular by the prospect or receipt of old age pensions. It is relevant to note here that before the introduction of old age pensions, many elderly men and women voluntarily declared that they had deliberately committed offences in order to obtain the privacy, protection and shelter of a prison, and escape from the quarrels and interferences they were unable to avoid in the associated life of the Poor Law Institutions of those days.

During the period 1911 to 1928 the decrease in the incidence of indictable crime per million of the age-groups was greater in men over 60 than in any other adult age-group in each official main class of crime, except forgery and offences against currency. In the year 1928, however, there was a large increase in the incidence per million in the age-group 50 to 60 as compared with the year 1911 for obtaining by false pretences, frauds and receiving, etc., although all other official groups of indictable offences showed a diminution at this age-period.

Acquisitive offences are often committed by professional criminals, many of whom in course of time figure in the older age-groups. Thus, a man born in 1882 was first convicted in 1897 for theft, and had been convicted 15 times by the year 1930, when he was sentenced for forgery for the fifth time.

In 1929 the North of England had been suffering acutely from industrial depression, but the percentage to total numbers of indictable offences committed by men over 60 years of age was 2·1 in the North and 2·8 in the South of England. The general effect of a series of tables in the Criminal Statistics for that year showed that the industrial depression in the North had not made the incidence of crime among men aged 30 higher in the North, and at many points it was lower than in the South of England.

I have stated elsewhere that clinical experience suggests that in many cases as one gets older personality seems to be a more important crimino-genic factor than environment. In young and middle-aged persons a first offence is only occasionally an early indication of mental abnormality; in elderly persons it should at once arouse doubts as to whether it is the result of senile degeneration. Repeated offences at all ages may be due to a minor mental abnormality, or to the formation of an acquired habit, and records show that this may arise in early life or later. Thus, a man born in 1862 was first sentenced to three months' imprisonment for theft in 1882. In 1930 he was sentenced to three years' penal servitude and six years' preventive detention for receiving stolen property and being a habitual criminal. In the interval he had been convicted for stealing, housebreaking and the like on 25 occasions, and in addition to many short sentences had received eight sentences of penal servitude and one of preventive detention. Another man born in 1861 was unconvicted until 1898. In 1929 he was sentenced four times to penal servitude for three years, the sentences to run concurrently and to be followed by seven years' preventive detention as an habitual criminal. He had been convicted on 17 other occasions for theft, burglary and similar offences, and had served four previous sentences of penal servitude and one of preventive detention.

The Annual Reports of the Prison Commissioners for the ten-year period 1929–38 show that of convicted prisoners received into prison for indictable offences, non-indictable offences akin to indictable offences and other non-indictable offences, whose ages were 21 years and over, 304,384 were under and 27,128 were over the

age of 60, a proportion in round figures of 11 to 1. During the same period 207 offenders between the ages of 21 and 60 were sentenced as habitual criminals to preventive detention under the provisions of the Prevention of Crime Act, 1908, Part II, a proportion of almost 5 to 1.

All the witnesses who gave evidence before the Departmental Committee on Persistent Offenders and had experience of Part II of the Prevention of Crime Act, 1908, agreed that the existing provisions were unsatisfactory. The fact that so few cases have been dealt with under the provisions show that they are usually recognized to be ineffectual for the purpose for which they were intended. Nevertheless, the figures quoted above suggest that there is some association between recidivism and the later period of life; that, in fact, many habitual criminals are undeterred by age from committing crime. If the proposals in the Criminal Justice Bill, 1938, are accepted, whereby courts are to be enabled to pass sentences of preventive detention in lieu of, but not in addition to, sentences of penal servitude or imprisonment, the age-incidence of those so sentenced should be instructive.

There would seem to be almost no upper age limit to crime. Arado refers to a woman aged 82 who was then sentenced in America to 14 years' hard labour. She had been before the courts 30 years before for criminal abortion. Septuagenarian women abortionists are not uncommon in this country. As one of them remarked: "You do not need your eyes to work down there."

So far the general criminal population in prisons has been considered. Goring analysed the age-incidence of 682 first offenders convicted of serious offences and awarded sentences of penal servitude. He found the cases centred around three distinct age-periods: A period of adolescence and early manhood, rising rapidly to, and falling rapidly from, its culminating point, which occurred between the ages 20 and 25; a more protracted and less emphatic middle age-period, rising and falling less rapidly to and from a point of maximum intensity which occurred between the ages of 35 and 45; and a transient period between the ages of 60 and 65 when an exacerbation occurred in an otherwise rapidly diminishing tendency towards crime.

In a recent* group of 9,197 prisoners of both sexes in the prisons of England and Wales convicted of various offences, 290 were aged 60 years and over. Of these 71 were first offenders and 194 had been previously convicted three times or more. The elderly offender is often the professional criminal at the close of his career, and viewed generally official statistics throw little light upon the mental background associating crime with senescence and senility.

Senescence and Crime.

In his Goulstonian Lectures on "The Neurology of Old Age" Macdonald Critchley quoted Létienne, who "was bold enough to attempt a definition between senescence or healthy old age and senility; he states that in the former there are modifications in the organism which must not be looked upon as disorders; while in the latter there are actual alterations or lesions. Therapy is possible in the one he says, but impossible in the other. Critchley adds: "The inadequacy of this proposed definition is obvious, and I believe that no useful purpose is served by setting up artificial distinctions between the two states."

Nevertheless, in criminal situations the welfare of the community must be considered as well as the personality of the offender, and crisp views must be fashioned if possible regarding the anti-social potentialities of law-breakers. If, as many believe, growing old is as natural a process as growing up, and senescence is the counterpart of adolescence, it becomes a matter of practical importance to differentiate criminal behaviour which is associated with senescence, as a recent improvisation in the life-history of the offender or the continuance of a long established habit, from offences which are attributable to the functional or organic mental diseases of senility.

Rothschild and others have pointed out that there is no correlation between the intensity of mental symptoms in the aged and the severity of the ascertained pathological changes. Wartman found in 500 consecutive autopsies that 90 per cent. of the men and 85 per cent. of the women over 60 years of age had cerebral arteriosclerosis, although 90 per cent. of the men and 85 per cent. of the women

* April 3, 1944.

did not show mental symptoms. Rolleston considers that the difficulty of determining accurately where physiological involution ends and pathological lesions begin has caused confusion between physiological old age or senescence and the pathological condition of senility. He observes that the exceptional occurrence of the ideal condition of physiological involution without any definite evidence of superadded pathological change is shown by the experience of Warthin, who in 30 years of pathological work saw only 25 necropsies of uncomplicated senile death. Rolleston believes that old age is almost always but relatively physiological. Critchley considers that clinical and pathological study of the nervous system in senility suggests that ageing is not entirely a simple physiological process nor yet an exclusively pathological state, but that both features are operative though their relationship cannot as yet be determined. Robbins, Watters, Eustis and others find it convenient to differentiate between physiological, normal, old age and pathological, abnormal, old age. Bleuler states that senility often becomes a disease only as a result of the sudden cessation of the ordinary attractions of life, and Cameron opened a series of social clubs in connection with a special clinic to overcome the social isolation of the elderly, and the part played by loneliness and lack of social contacts as causative factors in their breakdown.

If senescence is a physiological condition and not a pathological incident of life, difficulty arises when an attempt is made to determine its onset. If the menopause in women is of some assistance in the matter where they are concerned, it must be admitted that its analogue in men is likely to elude detection. Although Werner describes in men vasomotor, emotional and intellectual difficulties comparable to those seen in women at the climacteric, other observers remark upon the vagueness of symptoms in men. Engle observes that the number of patients in large clinics presenting a male climacteric syndrome is small indeed in relation to the number of women with such symptoms, or in relation to the number of men in the total population. Werner placed the male climacteric at the age of 50. Havelock Ellis thought it began at the age of 38. He quoted Kenneth Walker, who places the age of this change of life in men at 55 to 60, Max Thorek at 7 to 10 years later than in women, Rankin at between 57 and 63, and Max Marcuse between 45 and 55.

In considering the climacteric changes in men and women it must be remembered that the conditions are not strictly comparable. In men the change does not terminate the capacity for reproduction, which may be retained into advanced age. On the other hand, women at the climacteric realize that their reproductive activity is ending, and sometimes seem to forget that many remain sexually attractive for some years, and often are more mentally attractive than when they were younger.

The chronological age of the average person may be a misleading indicator of the onset of senescence. Stanley Hall puts this in the early forties, Watters at 55, Adami at 55, and Dublin at 65. Many will agree with Rolleston that in healthy people the onset of senescence is so stealthy that it is seldom suspected by the individual, and that one man may be senile at 60 years of age, whilst another is vigorous in both mind and body at 80. The onset of senescence is seldom obvious at first to others, and since the senescent is often unwilling and sometimes unable to recognize its early subjective indications, it is often well established before it is accepted.

Clouston observed, nearly 40 years ago, that there is a period of mental peacefulness, calm and health, with even a reasonable amount of energy of the right sort in many cases between the crisis of the climacteric and the beginning of old age. Those who look back to the beginning of the century and compare their elders of that time with their fellows of to-day may believe that as the span of modern life has lengthened, so has the onset of senescence often been delayed, although the process of growing old has not necessarily been affected in other directions.

Senescence has claimed attention throughout the ages. David's prayer, "When I am old and grey-headed O God, forsake me not," seems to anticipate the feeling of insecurity which is so apt to disturb the declining years of life. When wrathful Elihu replied, "Neither do the aged understand judgment," he acknowledged the inevitability of mental deterioration and echoed Job's belief in the omnipotence of God, "who taketh away the understanding of the aged." The deliberate scepticism of Koheleth, suggestive of the physician's outlook, portrays the final stage of life with unrivalled imagery in the well-known verses of the last

Chapter of Ecclesiastes. But as one reads in Ecclesiasticus, " how comely is the wisdom of old men," it is permissible to think that perhaps the present times are not less happy in this respect than were the days of Ben Sira.

Cicero, defending old age in his famous dialogue, declared that " old men who are reasonable and neither cross-grained nor churlish find old age tolerable enough . . . old age is respectable just as long as it asserts itself, maintains its proper rights and is not enslaved to anyone . . . the great affairs of life are not performed by physical strength, or activity or nimbleness of body, but by deliberation, character, expression of opinion. Of these old age is not only not deprived ; but, as a rule, has these in a greater degree. . . . Old men retain their intellects well enough if they only keep their minds active and fully employed . . . the crowning grace of old age is influence. . . ."

Shakespeare's sure thumb-nail sketch of the physical signs of old age and his inimitable portrayal of the senile psychoses are well known. Sir Thomas Browne refers to " that stupid Symptom observable in divers Persons near their Journey's End, and which may be reckoned among the mortal symptoms of their last Disease ; that is, to become more narrow-minded, miserable and tenacious, unready to part with anything when they are ready to part with all, and afraid to want when they have no time to spend."

It is not always wise, even if it sometimes seems to be desirable, to accept the standards of those around us. Osler wrote, " Insensibly in the fifth and sixth decades, there begins to creep over most of us a change, noted physically among other ways in the silvering of the hair and that lessening of elasticity, which impels a man to open rather than to vault a five-barred gate. It comes to all sooner or later ; to some it is only too painfully evident, to others it comes unconsciously, with no pace perceived. And with most of us this physical change has its mental equivalent, not necessarily accompanied by loss of the powers of application or of judgment ; on the contrary, often the mind grows clearer and the memory more retentive, but the change is seen in a weakened receptivity and in an inability to adapt oneself to an altered intellectual environment. It is this loss of mental elasticity which makes men over forty so slow to receive new truths. . . ." He declared that, "As we travel farther from the East our salvation lies in keeping our faces toward the rising sun, and in letting the fates drag us like Cacus his oxen, backwards into the cave of oblivion."

Thus orientated, the senescent, perhaps, can truly assess the intrusions of the arrogant publicist, the posings of the unseemly exhibitionist, and the achievements of the honest scientist. Thus orientated, the senescent may wonder whether we do not become adapted to the idea of death by the discordant changes of an ever-changing world, which disturb our equanimity, cause us to war against novel substitutes and lead us to think that, perhaps, after all, the cubists, crooners, irresponsible poetasters, jazz-band musicians and other freakish upstarts of our time serve a useful purpose in reminding us that " a satiety of life brings on the ripe time for death."

Many attributes of senescence may adversely affect the individual, and criminal behaviour may be due to an unexpected jolt to a tottering personality. When crime is associated with senescence, it is important to remember that ageing is not always a uniformly progressive and unobtrusive reduction of physical and mental power. A physical illness, grief or other severe emotional disturbance in an aged person may trouble the even tenour of life and quicken the rate of mental deterioration, but for some time this may escape remark, particularly if the quickening is of short duration.

However this may be, personal experience of senescents has never offered to me any instance in which physical and mental deterioration alternated in a manner at all comparable to the alternating periods of physical and mental development of childhood.

In criminal cases, when the police are unable to avoid delay in arresting a suspected offender, there may be special significance in the fact that in senescence the memory for recent events becomes impaired, and reminiscence prevails. The reasoning power does not necessarily become less, and often gains in strength and reliability until age is well advanced. Indeed, the wisdom of age, founded upon experience, is sometimes so impressive that it cannot be set aside lightly as an imaginary or ephemeral quality. And although intellectual resilience and the

receptivity for new ideas are weakened in senescence, and decisions are reached with less alacrity than formerly, there can be no doubt that the amount of crime in the later periods of life is diminished; in part by the fact that conduct is more influenced then by knowledge, reason and restraint, and is less affected by opportunity, emotion and the stimulation of the senses.

Essential competition is no longer a prominent factor in the lives of aged persons, and many are dependent upon the efforts of others for their well-being. They tend to become less acquisitive as well as less aggressive, and regulate their conduct accordingly. And although their altered sense of values may be in some degree defensive in character, it also often seems to be related to the fact that the demands of others upon them are fewer and less insistent, so that acquisitive, sexual and aggressive responses in social or antisocial directions are less inevitable and more easily controlled.

Perhaps one of the most outstanding evidences of senescence is the failure to command the attention and authority of former years. When an employer becomes for practical purposes the employee of his partner he may be exploited and forced unwillingly to take part in a fraud without fully understanding the implication of his act. And he is sometimes left to face the consequences alone.

The question of employment in old age is important. Since the industrial worker is often wrongly placed, and finds frustration and unhappiness in his occupation instead of fulfilment and satisfaction, he is sometimes surprised in later years to find that work is a privilege, and that the longer a person remains at a well-chosen occupation the longer will he enjoy life and experience the satisfaction which, in general, opposes antisocial behaviour. Even in advanced old age the privilege of personal service to others can often be enjoyed, and many senescents remain younger in thought by utilizing their leisure in assisting their friends. On the other hand, when greed, selfishness, uncharitableness, laziness and other undesirable personal traits have been unchecked throughout life they may become more noticeable as age advances and unmasks them.

An additional reason for continuing to work as long as possible lies in the fact that although the emotional tone of the senescent is often lowered, old age can claim no immunity from anxiety and grief. When this comes it may prove overwhelming so that mental stability is only retained by the aid of labour, which is particularly effective in these circumstances if dedicated to an altruistic purpose. And whereas in earlier years a great sorrow may be resisted by the knowledge that it will be softened by time, even though the time be long, in old age there may be insufficient time in which to wear it down, and insufficient inclination to attempt to do so unless supported from without. Indeed, here as elsewhere throughout life, hard work is often the best antidote to grief and disappointment.

The significance of leisure is receiving increasing attention to-day from many thoughtful observers. It is often enjoyed mistakenly. Prolonged idleness corrupts and becomes irksome as well as harmful to the active-minded man, who may add cubits to his stature if he occupies his spare time with creative pursuits which harmonize with his ambitions and abilities.

The senescent suffers from, or profits by, the increased leisure which is his portion in later years, and since his circle of friends inevitably shrinks it becomes important to select the method of recreation which is most appropriate for the individual. In youth recreation serves a two-fold purpose; first, as a relaxation from labour and as a revivifying factor in promoting further endeavour; and second, as a means of training by individual and team exercises for the stern realities of life. In middle age the main purpose of recreation is to re-create; in old age to delay decrement.

If the restricted power and poorer achievements of old age are wisely accepted as being inevitable, and are at the same time carefully exploited, the senescent may long continue to enjoy and profit by his former recreations. Happily, it often seems that intellectual or operational skill lasts longest where it has most attained success, and may even be extended in directions which have remained unexplored through lack of time or opportunity. Nevertheless, the age-groups in our ever-changing modern world are still more or less segregated from each other, and the occupations as well as the amusements of aged persons become less social, less varied, more solitary and more proprietary than before. Unless the problem of leisure is treated with as much consideration in old age as it requires in youth and middle age an undesirable pattern of life may be adopted, and crime result

from a newly acquired habit of relieving tedium by alcohol, or some other time-passing appeasement.

With regard to both work and recreation, McDougall's warning that when we cease to strive we begin to die may be linked with his belief that it is better to die living than to live dying.

To view old age, or any age-period in the life of the individual, in accurate perspective, it is necessary to consider it as a whole and avoid the appraisement of the intellectual, emotional and volitional qualities of the mind as isolated parts, since they overlap one another and are also influenced by external circumstances. This is apparent when a new project is introduced, for it not only requires to be perceived and understood in the light of intellect and reason, but it also excites an emotional response of satisfaction or dissatisfaction, and demands effort to make a decision for its acceptance or rejection. And just as in senescence the intellectual qualities of the mind may persist into advanced old age, so may the emotional qualities, and give rise to unexpected situations.

Intellectual reactions to the approaching end of life inevitably vary. Sir Thomas Browne said, " to learn to dye is better than to study the ways of dying." Thomas de Quincey wrote : " We should all think of death as a less hideous object, if it simply untenanted our bodies of a spirit, without corrupting them." Robert Louis Stevenson in his Samoan exile declared in the year before he died : " I wonder exceedingly if I have done anything at all good ; and who can tell me ? and why should I wish to know ? In so little a while I . . . will have ceased to be a memory ; and yet—and yet—one would like to leave an image for a few years upon men's mind—for fun." McDougall, on the other hand, held that the desire for fame after death was the most irrational of all desires ; and although a useful incentive for the young man was in old age foolishness, without mitigation of any kind.

Our social adjustments are largely affected by emotions which are apparent to others, but adjustment to the Infinite is often so elusive that it appears to be inconsistent to the onlooker. For example, the meticulous adherence to a high standard of moral conduct associated with a disregard for religious observance, or persistent evil-doing associated with fervent applications to Divine Authority, are everyday incidents.

A reluctance to deal with the problems connected with adjustment to the Infinite is sometimes observed in youth, and even in middle age the matter may be postponed. But it becomes an ever-pressing concern to the aged. For some adjustment is in the making, and many attend church services to find spiritual satisfaction in religious communion, whilst a few turn to cults and idealisms for moral support. Still others, whose minds perhaps are more complex, doubting and analytical, with much toil find their adjustment in a bleak philosophy which, nevertheless, according to some thinkers numbers many among the best and happiest of men. Henry Maudsley, at the age of 82, wrote : " Of the two lights available for human guidance in the gloomy vale of tears, toils and fears is the faith the greater and reason the lesser light ? That is the still disputed and unresolved question, which the optimist will continue to answer confidentially by the inspiration of feeling, the pessimist less confidently and more soberly, after his doubting fashion, by the dry light of reason."

This much seems certain, religion, animated perhaps by the emotional incitations of music and a chorus of amens, and undisturbed by criticisms of unproved assumptions, exercises a powerful influence on the lives of many. And if adjustment to the Infinite has been made on grounds which fully satisfy the truth-seeker, he may attain a mental peace which will serve him to the end. Religion, the unbroken link which unites the present with the past and is inherent in greater or less degree in all humanity, is one of our most important counterchecks to criminal behaviour. For although the obscurantism, errors and transgressions of some interpreters of doctrinal religion may offend us, there remains, and always will remain unharmed, a core of reality and truth which is universal in its application and abiding in its purpose. Even when adjustment to the Infinite excludes the tenets of orthodox religion, the very solemnity of the occasions when its principles are considered, and the tremendous issues involved, tend to establish a sincerity of thought and behaviour which opposes the commonplace amoralities of our time, and corrects the modern shift of interest from immortality to the urgent problems of the world about us.

The spectator viewing the emotional reactions of our modern world cannot fail to be impressed by the fact that not only sexagenarians and septuagenarians, but also octogenarians form romantic attachments which sometimes end in marriage. Those who have had opportunities to watch the progress towards, and the accomplishment of, such unions can have no doubt that their inspiration usually differs little from that of younger persons except in the physical content, which becomes in later years less important than its mental counterpart. Romance is encouraged by unusual circumstances, and the longevity of to-day, with its associated delay in the progress towards senescence, induces many understanding minds to believe that these unions are likely to become more frequent, and to regard them no longer with the disfavour of the lean-souled Victorian whose narrow point of view prejudiced his judgments on normality and abnormality in the sphere of sex. These alliances and their preliminaries cannot be omitted from our estimates of social and anti-social behaviour in the senescent of our day.

The tragedies of life are usually hidden from public view. So, too, the disappointments, regrets and painful memories which deepen the shadows in the mental background of the senescent who lacks equanimity and has too long delayed acceptance of the warnings handed down throughout the centuries:

> "The Worldly Hope men set their Hearts upon
> Turns Ashes—or it prospers; and anon,
> Like Snow upon the Desert's dusty Face
> Lighting a little hour or two—is gone."

And again:

> "I sent my Soul through the Invisible,
> Some letter of that After-life to spell:
> And after many days my Soul return'd
> And said, 'Behold myself am Heav'n and Hell'."

Indeed, memories are our most personal possessions, and may be our nearest approach to paradise or the pit. Men of outstanding sincerity write their records of the past in "marble memories which wear not out but with themselves." Others trace their painful recollections in the sea-washed sand, fearfully determined to rid themselves of the oppression. But the importance of memory was acknowledged by Lady Macbeth when she called it "the warder of the brain," and if the mental background of the senescent is to be clearly understood we must recognize the fact that his memories are significant, and may antedate by many years our own experience. Further, we must assess their value in the light of this limitation.

Yet it remains true that as the senescent looks back upon his unaccomplished tasks, he may derive a measure of comfort from the fact that sowers and reapers were differentiated one from another nearly 2,000 years ago, and that few may reap where they have sown. He may reflect that it can be a better thing to lay down stepping-stones upon which others may travel towards a worth-while goal than to construct a pathway which only leads to self-advancement.

In the field of criminology the action of the will may be considered as it is directed towards the discouragement of illegal acts which, in general, put the interests of the individual before those of society, and the encouragement of activities which are legal and useful to society, however strongly they may be opposed to the desires of the actor. And just as the intellectual and emotional attributes of the mind deteriorate in senescence, so does the power to will. A temporary or persistent exercise of will-power may be exhausting and is less frequently seen in the aged, although the negative will-power of obstinacy may be exaggerated. Will-power, forcing one to do what should be done in spite of personal wishes to the contrary, is necessary to attain a high level of accomplishment of course, but the senescent with a narrow self-regarding sentiment has usually reached towards the level of his desire, and failing this has often concluded that all is vanity, and that the effort required to gain the longed for end by an exercise of the will is out of proportion to the value of the offered prize. In practical situations the lessened amount of will-power which can be summoned, and the brevity of its duration, may indicate the degree of deterioration which is present if compared with the same qualities in former years.

Although the criminal law occasionally exploits an emotional situation, it is for

the most part concerned with facts and with reasoning. Forensic psychiatry, on the other hand, is mainly solicitous regarding the personalities and reaction patterns of mentally normal and abnormal men and women. As aged persons view the rapid passing of the years, they may well remember the wording of a memorable bulletin which told a tense public that the life of a very sincere and much loved man was "moving peacefully towards its close." If mental peace reward the later years of some, and even be our death-right, all do not attain it. And when the hitherto blameless senescent becomes involved in illegal behaviour, as the result of his mental deterioration, he deserves the fullest understanding from those who sit in judgment upon him. He may be denied this unless there is insight concerning the background of his mental life.

Senility and Crime.

Senescence then, apart from its physical concomitants, is characterized by a gradual lessening of the intellectual, emotional and volitional attributes of mind, whereby memory, perception, receptivity, attention, affection, interests and desires become restricted, less vivid and less compelling. It passes into senility when the impairment becomes excessive, the mental activities imperfectly synchronized, and when initiative, the ability to form well-considered opinions and sustained effort fail and social maladjustment results. The patients are less concerned with external events, they become increasingly egotistic, and their emotional life is impoverished. The death of relatives affects them little, although the outward expressions of emotion may be exaggerated. Dissatisfaction with their companions and surroundings marks the fact that the pleasures and obligations of former years have lost their appeal. Confusion of thought, a feeling of unhappiness or actual mental depression, disordered sleep, anxious forebodings concerning the present, and fears for the future, unwarranted distrust of others and suspicions regarding events, restlessness and resistiveness indicate the passing of normal senescence into abnormal senility, and suggest to the forensic psychiatrist the lines upon which he may shape his evidence in a criminal court.

It appears to be generally accepted that the reason senility develops in some persons and not in others depends in part upon their inherent constitutional make-up, and the degree of cerebral arteriosclerosis present, upon the stresses which they have experienced as well as the persistence of lifelong nervous symptoms, and indirectly upon their manner of life. It may be noted that in 100 patients suffering from psychosis with cerebral arteriosclerosis, Clow found that emotional disturbances were apparently by far the most frequent factors to upset their limited adjustment and precipitate a psychosis. Williams, Quesnel, Fish and Goodman consider that in senile psychoses social integration as well as financial independence have not been attained, or have been denied to the individual when most needed; and that preventive efforts would seem to offer some return. On the other hand, psychoses with cerebral arteriosclerosis tend to strike down the individual in a manner similar to other disease processes, personal and situational factors being relatively insignificant. These authors consider that preventive measures in such cases must await more exact understanding of the morbid anatomy and physiology of the disease processes.

The practical difference between senescence and senility in criminal cases is measured in terms of social adjustability and the capacity to deal with personal problems as they arise. The term senility is restricted here to senile and arteriosclerotic dementias. Other modifications of psychiatric illness occurring in the ageing such as presbyophrenia, Alzheimer's, Pick's, Jakob's and Kraepelin's diseases, the dementias following chronic psychotic and chronic toxic states, those associated with chronic neurological disorders and the like need no special consideration in the present context.

Dayton has recently stated that psychoses of the aged now appear as the leading problems of psychiatry, with senile and arteriosclerotic disorders showing a higher incidence than all other psychoses combined. However this may be, when aged persons are implicated in criminal proceedings it is desirable to differentiate the above conditions from senile and arteriosclerotic dementia. This applies with particular force to the differential diagnosis of the depressive and manic varieties of senility from examples of manic-depressive disease in the aged, and, generally,

the possibility of a return to extra-mural social usefulness will be assessed in the light of the previous history of the offender.

It may be difficult to distinguish senile from arteriosclerotic dementia in persons accused of crime, not only because of the occasional overlap of symptoms, but if prolonged observation before trial is impracticable. Reference has already been made to the work of Rothschild. He compared the symptoms and post-mortem findings in 60 patients, of whom half were diagnosed clinically as seniles and half as arteriosclerotics. He found that anatomically pure forms of either were less frequent than combinations of the two, but one or other predominated as a rule, and clinical evidence of a mixed nature was less frequent than might have been expected from the clinical findings. The criteria usually accepted in clinical psychiatry were further established. Senile psychoses occur later in life, are gradually progressive and last longer, and paranoid patterns are more common. Arteriosclerotic psychoses have usually a sudden onset, and show less intellectual impairment, more fluctuation in symptoms and transient neurological signs. Rothschild cautions against labelling any type of psychosis as senile arteriosclerosis when it affects an elderly person. In a later publication dealing with 28 cases in which the diagnosis of arteriosclerotic psychosis was confirmed at the post-mortem, many discrepancies were found between the extent of the local damage and the degree of intellectual deterioration. For example, structural damage in patients with severe intellectual impairment was sometimes less marked than that found in patients with less serious focal lesions.

Discussing 31 cases of senile dementia and 29 cases of arteriosclerotic psychosis, Rothschild states that a lowering of moral standards leading to sexual irregularities, alcoholic excesses, or dishonest practices occurred in a few members of both groups, but this was commoner among patients with arteriosclerotic psychosis. The senile dementia group included 23 female and 8 male patients, and the arteriosclerotic group 22 male and 7 female patients, and it seems possible that the sex-ratio had some connection with the result. For, in general, men commit crime more frequently than women, the proportion, in round figures, being 8 men to 1 woman in England and Wales.

In the early stages of simple senile dementia crime is usually of a minor character, but serious crimes are rather frequently associated with the depressive, manic and paranoid varieties. In the depressive cases attempts at suicide are common, and homicide, often altruistic in purpose, is not infrequent. The manic variety is rarer than the depressive in criminal as well as in civil practice, and the offences are sometimes trivial in character. The paranoid variety seems especially liable to occur in people who are accustomed to view their contacts with suspicion, and hallucinations and delusions often give rise to crimes of violence.

The emotional importance of events long past and the comparative insignificance of a personal crisis was well shown by a man aged 65, during a depressive phase of senile dementia. He murdered the elderly landlady who was the wife of his friend in spite of the fact that she had befriended him. He belonged to the labouring class and had led a quiet, temperate, industrious and introverted life. He cut the woman's throat as the result of delusions which were inherently incongruous, but the jury refused to accept the medical evidence of insanity and he was sentenced to death. At the after-trial medical inquiry into his mental condition he was unconcerned at his position, but broke down and sobbed when he referred to a girl he had not seen since their engagement to marry was broken off some 45 years before on account of religious differences. His affection for the girl remained constant, and his memories of her affected him much more than the fact that he had killed a kind and hospitable woman and that his own life was in danger.

In addition to the depressive conditions associated with senile and arteriosclerotic dementias homicidal offences are occasionally, but less frequently, associated with manic, paranoid and confusional states. In some cases acute or chronic alcoholic intoxication is a superadded feature, especially in cases of marital jealousy. Sullivan pointed out, and personal experience supports the view, that delusions of marital infidelity which result in crime are usually less absurd intrinsically in senile than in some alcoholic cases. The senile patient requires little proof to support his suspicions, which may be extravagant but, generally, are within the bounds of possibility. The alcoholic rationalizes more elaborately and his beliefs are more absurd.

The slender grounds on which the delusions are based in senile dementia were apparent in a thatcher, aged 68. He shot his wife, aged 45, dead, in the mistaken belief that she had incestuous relations with her son, aged 20, and that she was pregnant in consequence. She was a sober, hard-working and respectable woman, and she called in a nurse as well as a doctor to examine her and convince her husband that she was not pregnant, but neither could persuade the homicide that his beliefs were false.

In matters involving criminal responsibility in the aged, regard must be paid, of course, to the fact that the conduct and mental condition of senile offenders should be compared with the standards of their former years as well as with the standards of so-called normal persons. Indeed, where mental abilities are strikingly superior in the prime of life, a perceptible amount of deterioration due to age may sometimes, in a criminal charge, escape recognition by a uninformed observer, who may regard the accused as above the average of intelligence and ability for his years.

Conclusion.

The mental background of the child delinquent, and of the adolescent and adult criminal, has rightly received increasing attention during recent years. Justice has been thereby assisted, and the reclamation of the offenders encouraged.

Although aged prisoners in this country have been for many years treated under a milder form of discipline than others, the mental background of the ageing offender before trial is also important, but has received less attention than is due, although the later period of life presents special problems to senescence and senility. The increasing recognition in modern days of the importance of studying the diseases of old age has enabled those who are concerned with the conditions which may affect criminal responsibility or medical culpability and treatment to view the aged offender more clearly, and these observations are intentionally discursive. For the aged offender must be regarded as a whole, and accurate estimates of his behaviour depend upon a synthesis of the physical, physiological, psychological, spiritual and psychiatric factors which operate in his special environment. My purpose is to insist that a knowledge of the mental background of the aged offender may suggest the most suitable way of dealing with him, and of protecting society from his misconduct.

Senescence will not acquit the offender of responsibility, although in advanced cases bordering on senility his mental condition may modify culpability to an extent which medical men believe, as a result of their experience of disturbed minds, should be taken into consideration by a court of trial in determining the award, because the degree of blameworthiness present lies somewhere between that which is attached to the illegal act of a mentally normal person and one who is irresponsible because of insanity.

In early stages of senile or arteriosclerotic dementia, culpability according to medical standards may be modified; in advanced stages the accused may be properly considered insane according to the law. In all cases appropriate awards or treatment can only be selected by taking into consideration with other facts what the aged offender was, as well as what he is. His weaknesses demand our understanding; they may claim our sympathy if not our respect.

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TYPES OF PERSONALITY: A FACTORIAL STUDY OF SEVEN HUNDRED NEUROTICS.

By H. J. Eysenck, Ph.D.,
Psychological Department, Mill Hill Emergency Hospital, N.W. 7.

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1. Introduction.

Few psychologists or psychiatrists would object to the statement that the whole field of personality and temperament study is in a state of acute conflict and dissociation. This is as true on the psychological side, i.e. in the field of experimental tests, questionnaires, ratings and so forth (69, 1), as on the psychiatric side, i.e. in the field of the diagnosis and classification of mental disorders (39, 9). In the present paper an attempt is made to locate the fundamental trait-vectors in terms of which personality and temperament can be most parsimoniously described, and to demonstrate that the results thus obtained from a detailed analysis of psychiatric ratings and experimental tests carried out on 700 neurotics can serve to integrate findings from a wide variety of sources, which at first glance seem confused and even contradictory.

It was decided to use neurotics as subjects in this study because, as Slater has pointed out, " neurosis presents a special case of a generalized type of behaviour, and signifies a failure of adaptation. Its two primary reagents are the individual constitution and the environmental set-up of the moment " (65). It is with the fundamental traits of this individual constitution that we are concerned here, and we may regard the failure of adaptation to the environmental set-up as an invaluable experimental means of bringing out and emphasizing these underlying traits. That this argument is not devoid of justification is shown by the fact that Slater found comparatively high correlations, considering the unreliability of the material, between the personality traits characteristic of, and the symptoms exhibited by, the neurotic army patients studied by him (65).

The difficulties which arise in attempting to deal with types of individual constitution require a solution in terms of a statistical procedure specially devised to deal with problems of classification. Such a procedure is available in the form of factorial analysis (10). Certain attempts have been made in the past to apply factorial methods to these problems; they will be reviewed briefly in a later section. Much of this work has suffered from certain weaknesses which considerably lower its value. The number of subjects used was often extremely small; the number of variables correlated was seldom large enough to allow of the unambiguous definition of factors; the method of selection of subjects was frequently open to criticism; raters were often untrained in their exacting tasks; such factors as the " halo " effect were not always controlled; and lastly, the interpretation of factors was sometimes undertaken with a lack of consideration which contrasted strangely with the extreme care taken over the purely mathematical aspects of the work.

In the present investigation an attempt has been made to avoid these pitfalls as far as possible. Greene points out that studies of this kind suffer from a paucity of facts when less than 300 persons and less that 40 items are used (31). We have used 700 persons and 39 items; another item, giving the results of a follow-up study, was not available in time to be included in the analysis. As will be explained more fully in the next section, the subjects were all neurotic male soldiers referred to the Mill Hill Emergency Hospital, representing successive admissions except

for certain cases excluded because various physical factors and symptoms complicated the simple neurotic picture.

Ratings on the items selected were given by the psychiatrists in charge of the patients; for many items objective evidence, such as intelligence test scores, work histories, documents relating to marital status, etc., was available. It was hoped that ratings given by psychiatrists, i.e. by persons with wide experience in the field of personality study, would be more valid than the usual type of rating given by friends and acquaintances, particularly as the psychiatrist does not have to rely on his own knowledge of the patient alone, but can call upon the reports of nurses, P.T. instructors, occupational therapy supervisors, relatives of the patient, army officers, etc., all of whom see the patient from some different angle, and are in frequent contact with him.

In spite of these opportunities it always remains possible that psychiatric ratings are influenced by "halo" factors, by preconceived opinions, or by systematic views regarding the relation between various symptoms. For this reason emphasis was laid in the selection of items on those which could be determined with a maximum of objectivity, such as presence or absence of hysterical conversion symptoms, method of disposal, i.e. whether returned to duty or boarded out of the Army, presence or absence of pain, tremor, fainting spells, etc. Diagnoses, being of little objective value, were not included in the analysis.

Another precaution against an undue prevalence of *systematic* error consisted in the fact that the ratings were made, not by one psychiatrist, but by over a dozen, all different in their theoretical leanings. Thus to some extent at least we may hope that the errors occurring through bias will be *random* errors, and thus cancel out. This type of error would reduce the correlations between the items, but would leave the trait-pattern unaffected. In spite of these precautions, systematic bias was probably not entirely eliminated, and the reader is warned not to take all the correlations reported at their face value.

2. The Experiment.

The experimental population consisted of 700 male neurotic soldiers, referred to Mill Hill Emergency Hospital for investigation and treatment. Originally the group to be studied numbered 1,000, but in order to reduce the complexity of the factors operating the following groups of cases were excluded: cases of epilepsy, cases where head injury formed part of the present illness, cases with previous organic disease of the central nervous system, or with physical signs of present organic disease of the central nervous system, cases in whose illness psychological causes were unimportant, cases with organic mental syndromes, and cases where physical illness was an important factor.

Our group thus consists of a fairly representative sample of male army patients suffering from the mainly reactive types of mental illness, in whom there are no signs of serious physical injury or illness, and in whom psychological causes are judged to have been important factors in the production of the illness. No attempt was made to equate the numbers of patients diagnosed as hysterics, anxiety neurotics, depressives, psychopaths, etc.; apart from the patients excluded on the above-mentioned grounds, our group represents successive admissions, completely unselected.

The ratings and tests used for the present investigation were selected from some 200 items recorded for each patient by the psychiatrist in charge of that patient, by the psychologist giving the test, or by the social worker investigating the early history and the family of the patient. The items chosen were determined by two main considerations. In the first place there was the important consideration that each item should have some definite psychological bearing on the illness and the personality of the patient; inevitably opinion will differ as to the wisdom of including certain items on these grounds, while excluding others. In the second place, there was the statistical consideration that each item should be noted in more than 10 per cent. and less than 90 per cent. of the cases, as otherwise the correlation coefficients derived from the data would be distorted.

In Table I are given the actual items used. These items are given in a dichotomized form, even when the original data were normally distributed; thus, for instance, the intelligence test results, although recorded continuously on the records

TABLE I.

	Number of times noted.
(1) *Age above 30* vs. age below 30	270
(2) Modal civil occupation: *Unskilled and semiskilled* vs. skilled, administrative, or professional	538
(3) *Little and much unemployment* vs. no unemployment	294
(4) *Work history degraded, or unduly frequent changes of occupation* vs. steady work history	71
(5) Abnormality in parents or siblings (psychosis, epilepsy, mental deficiency, neurosis or psychopathic personality) *present* vs. absent	275
(6) Home atmosphere during childhood and adolescence: *unsatisfactory* vs. satisfactory	226
(7) *Married* vs. engaged, single, widowed, separated	463
(8) Membership of political, social, cultural, industrial or other groups: *nil* vs. active or half-hearted	574
(9) Hobbies and interests: *narrow* vs. broad	550
(10) *Moderate or excessive alcohol* vs. teetotal or abstemious	377
(11) Mental health before present illness: *symptoms in childhood, symptoms and behaviour in adult life indicating clear predisposition, or definite illness* vs. normal	488
(12) Well organized personality, adaptable, stable: *No* vs. Yes	448
(13) Weak, dependent, timorous personality: *somewhat or very* vs. not	393
(14) Drive and energy: *inert, without initiative* vs. average go or conspicuous energy	505
(15) Cyclothymic or consistently depressive or hypomanic: *somewhat or very* vs. not	265
(16) Schizoid, seclusive: *somewhat or very* vs. not	235
(17) Hypochondriacal personality: *somewhat or very* vs. not	220
(18) "Obsessional," meticulous: *somewhat or very* vs. not	123
(19) Somatic anxiety (palpitations, dyspnoea, precordial discomfort, sweating, flushing, diarrhoea): *Yes* vs. no	386
(20) Fatigue, lassitude, effort intolerance: *Yes* vs. no	417
(21) Dyspepsia, vomiting: *Yes* vs. no	122
(22) Fainting, fits: *Yes* vs. no	101
(23) Pain—not of demonstrable organic origin and excluding headache: *Yes* vs. no	174
(24) Tremor: *Yes* vs. no	183
(25) Sexual anomalies (impotence, ejac. praecox, masturbation worries, homo-sexuality, others): *Yes* vs. no	89
(26) Irritability: *Yes* vs. no	164
(27) Apathy, retardation: *Yes* vs. no	97
(28) Hysterical attitude to symptoms: *Yes* vs. no	228
(29) Muscular tone and posture: *Poor* vs. good or average	92
(30) Headaches: *Mild or severe* vs. none	413
(31) Anxiety, anxiety dreams, battle dreams: *moderate or severe* vs. none or mild	352
(32) Depression: *moderate or severe* vs. none or mild	229
(33) Hypochondriacal symptoms: *mild, moderate or severe* vs. none	244
(34) Hysterical conversion symptoms (motor, sensory, special senses, visceral or other): *Any* vs. none	215
(35) Stress of bombardment or exposure among chief psychological causes of illness: *Yes* vs. no	137
(36) Stress of wartime separation and regimentation among chief psychological causes of illness: *Yes* vs. no	469
(37) Stress of domestic problems among chief psychological causes of illness: *Yes* vs. no	202
(38) Intelligence: *Below average* vs. average or above	183
(39) *Boarded out of the army* vs. returned fit for duty	171

kept by the hospital, are given here only as " below average " and " average above." This was done in order to make possible the calculation of coefficients association; many of the ratings being in dichotomous form in any case, no oth method was practicable, and indeed it was doubtful if the data were sufficien accurate to warrant more refined statistical treatment, such as the use of biser correlations, for instance. In the Table the aspect of the item which was ar trarily regarded as the positive aspect is italicized in each case; the numb on the right-hand margin gives the number of times each item in italics occurs in the experimental population.

The intelligence test used in order to determine the position of the subject with regard to Item 38 was the Progressive Matrices Test (59). I have elsewhe reported a detailed analysis of the scores of some three thousand neurotics on th test, as well as a comparison with the scores of normal subjects (20); the resul showed that on the average the neurotics were no less intelligent than the norma but that the curve of distribution of scores for the neurotics was distinctly plat kurtic, as compared with the curve of distribution of scores for the normals. other words, among the neurotics there was a higher percentage of subjects wit high or low intelligence, while the percentage of subjects of average intelligenc was considerably lower among them than it was among the normals. In anothe paper I have shown that the retest reliability of this test is only slightly lower fo neurotics than for normals, and that incentives are no more successful in increasin the scores of neurotics than in increasing the scores of normals (21).

The 39 items listed in Table I were correlated, using Yule's coefficient of ass ciation as the index of correlations (78); 741 correlations were obtained in thi way. Although this index is not directly comparable with a product-momen correlation coefficient, there is no objection to using it when we remain within single universe of coefficients. A rough-and-ready approximation to the produc moment correlation can be obtained by multiplying each coefficient of association by three-quarters.

3. Results.

The intercorrelations between the 39 items are reported in Table II In Table III are given the factor saturations of these 39 variables for fou factors, together with their communalities. The factorial pattern of the first tw factors is shown in geometrical representation in Fig. 1. The method of analysis used was Burt's General Factor Summation Method, in which the diagonal value are determined by an iterative procedure (10).

It will be seen that the first factor, which contributes 14 per cent. to the variance has positive saturations throughout, while the second, third and fourth factors contributing 12 per cent., 8 per cent. and 6 per cent. respectively to the variance, are bipolar, having about as many positive as negative saturations. Altogether, these four factors account for 40 per cent. of the variance, leaving a " uniqueness " of 60 per cent. The fact that the " communality " is rather small as compared with the " uniqueness " is of course due to the fact that a number of variables were included in our list of 39 items which show only very low correlations with any of the four factors; examples are age, bombing and exposure, alcohol, headache, degraded work history, etc.

The first, or general factor, is defined by the items having the highest saturations with that factor, i.e. badly organized personality, dependent, abnormal before illness, boarded out of the army, narrow interests, little energy, much unemployment, dyspepsia, schizoid personality, poor muscular tone, abnormality in parents, no group membership, cycloid personality, and unsatisfactory home, to take only items having a correlation of over ·40 with this factor. Quite clearly, the factor is one of " neuroticism," or " lack of personality integration "; it is almost completely defined by the item " badly organized personality," which correlates with the factor to the extent of ·92. As will be argued in the next section, we consider this factor to be the obverse of the general factor of integration or " will " discovered by Webb (72), and generally referred to as " w," and to be identical with a general factor of " neuroticism," often falsely labelled " introversion," which emerges from many American questionnaire studies.

23.	24.	25.	26.	27.	28.	29.	30.
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—·27	·02	·33	·02	·00	·29	·00	·17
·00	·23	·37	·10	·00	·06	·08	·12
—·07	·13	·44	·04	·00	·22	·20	·12
·01	·20	—·08	·21	·02	·00	·00	·37
·01	—·05	·48	·01	·06	·40	·11	—·03
·08	—·02	·26	·03	—·29	·45	·03	—·10
—·21	—·13	·52	·25	·02	·21	—·04	·07
—·04	·28	·33	—·06	—·10	·22	·47	·12
—·10	·34	·26	·27	·05	·40	·61	·09
—·16	·45	·13	—·11	—·13	·35	·47	·19
·03	—·23	·49	·03	·19	·31	·57	—·18
—·03	·11	—·28	·36	·18	—·11	·35	·12
·09	·20	·55	—·13	·13	·05	·38	·11
·30	—·19	—·47	—·03	—·13	·44	·38	·15
—·07	·19	·03	·30	·12	—·39	·26	·01
·16	·18	—·40	·12	—·25	—·40	·23	·16
·42	·08	—·46	·07	·13	—·25	·30	·11
·45	·13	—·07	·12	·69	·30	·16	·29
—·13	·13	—·16	—·31	·00	·18	·45	·21
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..	..	—·19	·25	·02	·00	·21	·23
..	..	..	—·41	—·20	·39	·26	—·41
..	..	..	..	·41	·01	—·13	—·42
..	..	..	..	..	—·10	·01	·35
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The second, bipolar factor presents us with a dichotomy which contrasts, on the one hand, anxiety, depression, obsessional, apathy, irritability, and on the other, hysterical conversion symptoms, narrow interests, little energy, sex anomalies, hysterical attitude, no group membership, and unskilled. This differentiation bears out Jung's well-known statement that " medical experience has taught us that there are two large groups of functional nervous disorders—the one embraces all those forms of disease which are designated hysterical, the other all those forms which the French school had designated psychasthenia. . . . The hysteric belongs to the type of Extraversion, the psychasthenic to the type of Introversion " (43).

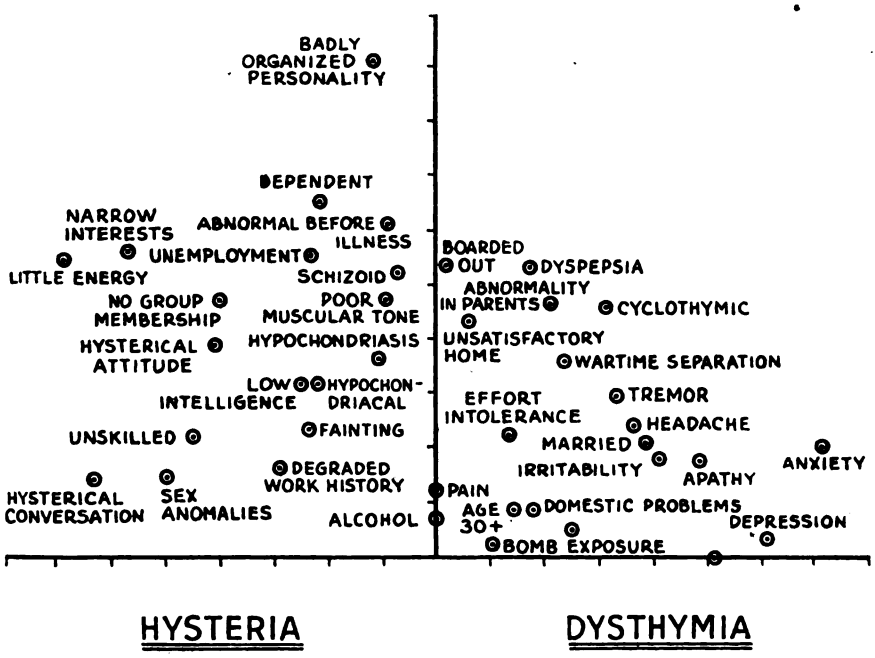

FIG. 1.

Similarly, McDougall writes: "There are . . . two great categories of disorder under one or other of which we may attempt to place many of the cases, though without confidence in respect to many of them. . . . These two categories are the dissociative or the hysteric class, on the one hand; the neurasthenic or anxiety class, on the other. The liability to disorder of one or other of these two great types seems to be a matter mainly of innate constitution; persons of the extravert temperament seem more liable, under strain, to disorder of the hysteric or dissociative type; those of introvert . . . temperament to disorders of the neurasthenic type" (52). (McDougall uses "neurasthenia" in the sense in which the French writers use "psychasthenia"; we have preferred in this paper to use neither of these obsolescent terms. Instead, the term "affective disorder" or "dysthymia" is suggested for the anxiety-depression-obsessional group).

As will be argued in the next section, we consider this bipolar "type" factor* to be identical with the introvert-extravert dichotomy, with Cattell's factor of "surgency," and with Pavlov's concept of "inhibition." In this paper, therefore, we shall refer to the first factor as one of *Integration* as opposed to *Neuroticism*;

* By calling this factor a "type" factor I do not mean to imply a bimodal distribution of persons belonging to the two sides of the dichotomy in the general population; the actual distribution of the general trait of which hysterics and affectives form the extremes cannot be determined without further investigation.

TABLE III.

Variable.	Factor saturations. 1.	2.	3.	4.	h^2.
1. Age above 30	·08	·14	—·27	—·22	·15
2. Unskilled	·22	—·45	·12	—·48	·49
3. Unemployment	·55	—·23	—·12	—·36	·49
4. Degraded work-history	·16	—·29	·16	—·29	·22
5. Abnormality in parents	·47	·21	·35	·31	·48
6. Unsatisfactory home	·43	·06	·45	·00	·38
7. Married	·21	·39	—·12	—·19	·24
8. No group membership	·46	—·40	—·16	—·32	·50
9. Narrow interests	·55	—·57	·04	—·10	·63
10. Alcohol	·07	·00	·17	—·36	·16
11. Abnormal before illness	·61	—·09	·24	·33	·56
12. Badly organized personality	·92	—·12	·35	·15	1·00
13. Dependent	·65	—·22	·06	·24	·53
14. Little energy	·53	—·69	·06	—·24	·82
15. Cyclothymic	·46	·31	·00	·37	·45
16. Schizoid	·52	—·07	·26	·29	·42
17. Hypochondriacal personality	·31	—·22	—·41	·07	·32
18. Obsessional	·00	·51	·07	·25	·32
19. Somatic anxiety	·05	·25	—·37	·12	·21
20. Effort intolerance	·23	·13	—·63	·26	·54
21. Dyspepsia	·54	·17	—·36	—·01	·45
22. Fainting, fits	·23	—·23	—·42	·23	·33
23. Pain	·12	·00	—·39	·03	·16
24. Tremor	·30	·34	·17	·10	·25
25. Sex anomalies	·14	—·50	·54	—·01	·56
26. Irritability	·18	·41	·13	—·10	·23
27. Apathy	·18	·48	—·02	—·46	·47
28. Hysterical attitude	·38	—·41	·11	—·04	·32
29. Poor muscular tone	·47	—·09	—·17	·45	·46
30. Headaches	·24	·36	—·15	—·06	·21
31. Anxiety	·21	·72	·14	—·09	·59
32. Depression	·04	·61	·02	—·23	·42
33. Hypochondriasis	·36	—·11	—·79	·24	·82
34. Hysterical conversion	·14	—·63	·08	·11	·44
35. Bomb and exposure	·02	·10	·03	—·04	·01
36. Wartime separation	·36	·23	·39	·23	·38
37. Domestic problems	·08	·17	·17	—·19	·11
38. Low intelligence	·32	—·25	·08	—·13	·19
39. Boarded out of army	·54	·02	·25	·05	·35
Variance	·14	·12	·08	·06	·40

(For full definition of variables Table I should be consulted.)

to the second as one of *Inhibition*, *Introversion*, or *Affective Disorder* (Dysthymia), as opposed to *Disinhibition*, *Extraversion*, or *Hysteria*.

The third factor is characterized, on the one hand, by items such as hypochondriasis, effort intolerance, dyspepsia, fainting, fits, pain, hypochondriacal personality, somatic anxiety, etc., i.e. by items stressing preoccupation with the body; on the other hand, by sex anomalies, wartime separation, unsatisfactory home, abnormality in parents, and badly organized personality, i.e. by items of a more psychological type. We may label this factor "*hypochondriasis*"; it also bears some resemblance to the concept of "*neurasthenia*" as defined, for instance, by Young (77).

The fourth factor is characterized, on the one hand, by items such as unskilled, apathy, alcohol, unemployed, no group membership, little energy, degraded work history; and, on the other hand, by items such as poor muscular tone, cycloid,

abnormality in parents, schizoid, abnormal before illness, obsessional, effort intolerance, badly organized personality, and hypochondriasis. Interpretation of this factor is difficult, particularly as few of the items show even reasonably high correlations with it. The conglomerations of traits having positive or negative saturations appear consistent enough, however.

Probably this factor distinguishes between the stupid, drunken, shiftless social misfit on the one hand and the " psychological conflict " group on the other. If this be indeed the correct interpretation, it is of interest mainly with regard to the description of the particular group studies, and hardly assumes systematic importance.

4. Discussion.

In this section we intend to show that the scheme elaborated in the last section, and in particular the first two factors found there, can serve to unify the rather diffuse results found by various investigators working in this field. At the same time, if it can be shown that much the same factors emerge in these studies of young and old, normal and abnormal, human and animal, as are found in our own experiment, we have an additional reason for accepting the factors described in the previous section as fundamental vectors in the field of personality and temperament.

Confirmatory evidence comes from four main sources: (1) Theoretical analyses; (2) questionnaires and ratings; (3) experimental studies; (4) animal studies. While there are certain points in connection with these studies which call for more detailed discussion, we venture to maintain that on the whole the results support our interpretation.

(1) *Theoretical analyses.*—We have already mentioned that our second factor is in line with the theoretical views of Janet, Jung and McDougall with respect to types of personality. *A fortiori* we may also claim that our results are in agreement with the views of older writers to whom Jung acknowledges his indebtedness, such as James, Jordan, Gross, Heymans, Ostwald, Kant, and Herbart.

Among more recent authors, many typologies have been worked out which seem to be based fundamentally on the same distinction emphasized in our analysis. Holt's adient and avoidant types (38), Kempf's anabolic and catabolic types (44), Eppinger and Hess's vagotonic and sympatheticotonic types (19), Kretschmer's schizothymic and cyclothymic types (47), Bleuler's schizoid and syntonic types (7), Wertheimer and Hesketh's syntropic and idiotropic types (73), Jaensch's B- and T-types (40), Rosanoff's antisocial and cycloid types (61), Freud's compulsive and narcissistic types (26), the adrenergic and cholinergic types of the physiologists—these are only a few examples of current psychological and psychiatric theorizing which seem to stress the same dichotomy found in our analysis.

As regards the first factor which emerged in our analysis, it seems to be related to such concepts as McDougall's " self-regarding sentiment " (53) and Freud's " ego-ideal " (27), to Janet's view of " psychic tension " (42), Hollingworth's view of " redintegration " (37), and Pavlov's theory of " strength of nervous functioning " (58). Slater has suggested that " neuroticism " is a variable which is distributed normally, and our results, as far as they go, are not in conflict with his view (65).

(2) *Questionnaires and ratings.*—Vernon has pointed out that " it is probable that the general factor in self-rating tests does in part correspond to a genuine maladjusted-psychoneurotic-introverted tendency, which is manifested both in overt behaviour and in the judgments of acquaintances " (71). Bernreuter's demonstration that tests of introversion correlate as highly with tests of neuroticism as they do among themselves supports this view (4), but raises the question why introversion and neuroticism should appear highly correlated, if not identical, in these studies, while being quite independent in our own.

Collier and Emch have shown that discrepancies of this kind are due to the fact that authors of questionnaires of " introversion " have used Freud's conception of introversion rather than Jung's, thus equating it with neuroticism (15). According to Freud " an introvert is not yet a neurotic, but he finds himself in a labile condition; he must develop symptoms at the next dislocation of forces, if he does not find other outlets for his pent-up libido " (28). Jung, however, considers that " it is a mistake to believe that introversion is more or less the same as

neurosis. As concepts, the two have not the slightest connection with each other" (43). It would appear better to drop the term "introversion" in connection with neurotic questionnaires of the usual type, and to restrict the word to the Jungian sense, as otherwise it will become quite meaningless.

Studies of ratings also show this general factor of "neuroticism," or its opposite pole, "integration." Webb's "w" factor, extracted from the intercorrelations of a variety of ratings carried out on 200 students and 120 children, showed that such traits as perseverance in the face of obstacles, kindness, trustworthiness, conscientiousness, excellence of character and strength of will tended to go together; this factor is clearly the opposite pole of our factor of "neuroticism" (72). Garnett, in his re-analysis of Webb's data, found evidence for a factor, independent of "w," which he called "c" (30), and which closely resembles our second factor. Both the "w" and the "c" factor have also been found in analyses of ratings and tests carried out by Cattell (13) and by Studman (68). Burt's factor of "emotional instability" (11), and his demonstration that people can be grouped into type according to the prevalence of "aggressive" or "inhibitive" emotions (12), is relevant here, as is the demonstration of Hart *et al.* of the existence of a general factor of "emotional instability" (35).

(3) *Experimental studies.*—Using experimental tests instead of ratings, Brogden has confirmed the existence of the "w" factor; he showed that it was highly correlated with "resistance to suggestion" (8). This finding is particularly interesting in view of our own experimental demonstration that neuroticism and suggestibility are highly correlated (25).

Hartshorne and May (36), Line and Griffin (49), and Oates (55) also furnish evidence for the existence of a general factor of neuroticism or integration from analyses of the intercorrelations of various objective tests; Oates also confirmed the existence of a factor closely resembling our second factor. Maller's factor "c," or the "readiness to forego an immediate gain for the sake of a remote but greater gain," should also be mentioned here (51); his evidence came from the analysis or the intercorrelations of tests of honesty, co-operation, inhibition and persistence, carried out on some 700 pupils. Support for the general factor of integration comes also from the experimental work on persistence, as carried out by Ryans (64), Kremer (46) and others.

(4) *Animal studies.*—It has already been pointed out that our general principle of "integration" appears to be similar to Pavlov's concept of "strength of nervous functioning" (58). "Primary and chief significance attaches to the factor of the *strength* of the neurones which determines the basic division of types of higher nervous activity into strong and weak. . . . The formation of a reflex to strong stimuli serves as a kind of sign of the 'boldness' of the animal, or, what is the same thing, the working capacity of its nerve cells" (29).

Pavlov also found evidence for a dichotomy similar to our second factor. "With the collision of the excitatory and the inhibitory processes, there appears either a predominance of the stimulating process, disturbing the inhibition . . . or in other cases a predominance of the inhibitory process . . . , disturbing the excitatory process" (58). Krasnogorski duplicated this type of analysis with children (45), and Rosenthal has attempted to relate it to human typology (62), as has Pavlov himself (57).

Others who have observed constitutional differences in animals which appear similar to those emphasized in our second factor are James (41), Dworkin (18), Muncie and Gantt (54), Liddell (48), Anderson (3), Cook (16), and Maier (50). In addition to these observational studies, we have a certain amount of experimental testing, linked with correlational work, which essentially supports the hypothesis of an "inhibited" type; examples are the studies of Hall (32), Anderson (2), Biel and O'Kelly (5), Billingslea (6), Parker (56), and Yerkes (74). The work of Hall (33), Yerkes (75), Coburn (14), Stone (67), Utsurikawa (70) and Dawson (17) makes it appear likely that this trait rests on a hereditary basis, while reports by Rundquist and Bellis (63), Shirley (66), Hall and Lindsay (34), and Yerkes and Rhoades (76) suggest that it is related to endocrine and autonomic functions. While the results of these studies are very suggestive, and seem to lend some support to conclusions derived from human subjects, it should be realized that it is extremely hazardous to posit identity of function because of superficial similarities which may show fundamental differences in their causation. Work on animals is quoted

here largely in order to draw attention to the need for studying the extent to which such arguments by analogy are justified.

The results of our factorial study of the pattern of intercorrelations of 39 traits in 700 neurotic soldiers are thus seen to agree with the results obtanied from questionnaires, ratings, experimental and animal studies, as well as with the theoretical analysis of the organization of temperamental traits given by Janet, Jung, Pavlov, McDougall, and others. It appears that we have to deal with two predominant modes of organization:

(1) Strength of nervous functioning, psychic tension, self-regarding sentiment, super-ego, or as we have called this factor, *integration* as opposed to disintegration or neuroticism, is the first principle or generalized trait around which constituent traits can be grouped.

(2) Affective disorder, desurgency, introversion, repression, or, as we have called this factor, dysthymia as opposed to hysteria, is the second principle or generalized trait around which constituent traits can be grouped.

Having established these two main principles of organization, our next step must be to search for objective tests with which to measure the saturation of any given individual with these two factors, so that in time we may get away from the subjectivity of ratings. An example of the type of work which may ultimately lead to the development of a battery of tests for the measurement of the main dimensions of personality, a battery as reliable and valid as tests of cognitive functions are already, may be taken from our work on suggestibility: as has been shown elsewhere, objective tests of suggestibility correlate highly with neuroticism ($r = \cdot 66$), while showing no correlation with the inhibition factor (25, 22, 23). Work is in progress at this laboratory at the moment on tests of persistence, level of aspiration, tendency to repression, etc., in an attempt to lay the foundations for a battery of this kind. Work on body build has already established certain correlations between constitutional factors and the hysterical and affective disorders respectively (60); similarly, correlations have been obtained between these two types of personality and autonomic activity (24).

5. Summary and Conclusions.

Seven hundred neurotic soldiers, unselected except for the omission of all cases in which there were signs of physical injury or illness having a bearing on the neurosis, were rated by the psychiatrists in charge on 38 traits; scores on an intelligence test were also available. These 39 variables were intercorrelated, and the resulting matrix of 741 correlations factor analysed. The following results emerged from this study:

1. Four factors, one with positive saturations only, the other three with both positive and negative saturations, accounted for 40 per cent. of the variance.

2. The first factor extracted accounted for 14 per cent. of the variance, and was identified as a general factor of neuroticism, instability, or lack of integration.

3. The second, bipolar factor accounted for 12 per cent. of the variance, and was identified as a general factor of introversion, desurgency, or inhibition, dividing the patients into an hysterical and an affective group.

4. The third, bipolar factor accounted for 8 per cent. of the variance, and was identified as a general factor of hypochondriasis or neurasthenia, dividing traits stressing preoccupation with the health of the body from traits of a more psychological type.

5. The fourth, bipolor factor accounted for 6 per cent. of the variance, and seemed to be of little general interest. It divided the men examined into a social misfit group on the one hand, and a psychological conflict group on the other.

6. Evidence from work on questionnaires, ratings, experimental studies and animal studies was found to corroborate the existence of the two factors of *integration* and *inhibition*; these factors were also shown to fit in well with the conceptual framework of clinical and academic psychology.

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NEUROSES IN NATIVE AFRICAN TROOPS.

By L. A. Nichols, M.R.C.S., L.R.C.P., Capt. R.A.M.C.

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The patients forming the subject of the following paper were natives of East West and South Africa. The South African group are mainly Basutos, mostly non-English speaking, and hence interviews had to be carried out with the aid of an interpreter. To obtain correct perspective of their types of illness it is of course necessary to know thoroughly their customs, beliefs and mode of living. For the sake of brevity illustrations are given only from the Basuto tribe, although it must be borne in mind that there is considerable difference between this and the other groups in this respect.

The Basuto lives under a tribal system of primitive patriarchy. Each tribe is a closely knit unit of related families and is ruled by a headman, chief or sub-chief. Each chief is himself responsible to a paramount chief. They are a pastoral people leading a simple life in small villages. Their religion is monotheistic, and consists largely of prayers to God through their ancestors. Strict tribal customs, code of morals and superstitious beliefs govern their lives. Education as Europeans understand it is unknown; some, however, do attend missionary schools, commencing at the age of 8 or later, depending on how far from the village the school is situated. A few living deep in the hinterland may never have seen a white man, car, ship or the ocean. Many have been employed in the mines, working for six or nine months a year, carefully saving their money to buy more cattle and land at home.

Marriage occurs between the ages of 20–25. Commonly a man will ask his mother to tell his father that he would like a certain girl for his wife. Just as often the parents will choose the wife. She is usually from another village and incest laws are to-day similar to those of Europeans, the nearest blood relatives allowed to marry being cousins. Dowries are decided on between the two fathers, the boy's father paying perhaps 20 sheep, 10 cows and a horse, whilst the girl's father will supply blankets and household goods. The marriage ceremony lasts three days, and the girl, after due examination, will be proclaimed a virgin by the old women of the village. The bride may never call her father-in-law by his name—a taboo known as "Obitsitsematsaikalebitso." The couple set up house in the man's village.

When the wife thinks she is pregnant she goes to a well and places a pitcher filled with water on her head and then allows the container to fall to the ground and break. Immediately she departs for her mother's house and announces that the pitcher fell from her head. She does not return to her own home until a male relative of her husband comes for her. Until the seventh month of pregnancy intercourse is prohibited. Delivery is carried out by the witchdoctor, and the birth is announced to the husband by pouring water over his head if the child is a girl, and whipping him gently if a boy. Outside the door of the house a reed will be nailed if the child is a boy, and two reeds for a girl. Breast-fed till the age of 4, the child sleeps in his mother's blankets till he is 8 years old, and in the same room until 16.

At the age of 16 the boys go up into the mountains for a period of three months. Here they undergo ritual circumcision and are taught by the elders of the tribe their laws, customs, and especially implicit obedience to their fathers. They are extremely reticent about their stay in the mountains and are bound to secrecy by terrible oaths.

Divorce is carried out easily but is not common. The wife may return to her

father's house only if he is willing to repay the dowry given for her. A man may divorce his wife by returning her with her dowry to her father's house; children of the marriage are divided equally, an only child being kept by the mother. Their families are small, two or three children, and their expectation of life is about forty years; it is rare to find a patient with both parents alive. The father is feared and respected, demanding constant, implicit obedience from both his wife and children. All love and devotion are expended entirely on the mother.

Legal disputes are settled by the paramount chief and his court, composed of all chieftains, sub-chiefs and headmen. They are empowered to order any native to appear before them. Justice is dispensed mainly by fines. Stealing a horse will cost the thief two horses for the defendant and £9 or three cattle for his chief. An adulterer will pay the court £9 or three head of cattle. The fine for rape is £18 or six cattle to the court, but if the girl becomes pregnant the indemnity goes to her father.

The witchdoctors, however, are the people to whom the natives turn when in difficulty. They are of two types: the first is a herbalist recognized by the Government who unofficially may dabble in magic, and the second a pure exponent of sorcery. For these people, living at an almost animistic stage, all events, both natural and unnatural, all good or evil, and every sickness are attributed to spirits. The witchdoctors are thought to possess more "Mana" than other people, easier access to the higher spirits, and thus better able to placate the evil influences.

In a case of sickness the witchdoctor called in will examine the patient, burn some incense and make some incantation. He will order all members of the household to stay indoors and the house to remain in darkness. While the people are asleep the witchdoctor will return secretly to the house to bury herbs and bones at the corners of the house and at the threshold of the door. An assistant meanwhile makes subtle enquiries about the household, their friends and enemies. The following morning the witchdoctor returns and produces the "Litaola"—small joint bones of various animals. After sprinkling some water about the room he throws the bones on the floor and recites a tale, eventually describing the people who have sent a spirit to bewitch the patient. The father of the house, his arms having been anointed with snake oil, digs for the bewitched herbs and bones and discovers them by directions from the witchdoctor. The curse should then leave the patient, who is given medicine, bathed, anointed and blessed. If death should occur, it must be due to some more undiscovered bewitching material.

Wherever possible the witchdoctor prefers to throw his bones near a river, for by the waterside he has greater powers of protection against the "Tokoloshe"—the evil spirit of these people. The tokoloshe is envisaged as a small ugly black dwarf covered with hair. Children when persistently bad and disobedient are threatened with this legendary bogy man, and if their behaviour continues to be unruly, arrangements are made with the local witchdoctor to supply the tokoloshe—in reality, a small child dressed in black goat skin. At night, whilst the delinquent child is asleep the dwarf will pounce on him, emitting strange cries. In the ensuing struggle the hairy body is felt and gives rise to the utmost fear and terror. The next day the witchdoctor is called in and impresses on the child the necessity of good behaviour to appease the tokoloshe, and rids the child of the spirit by burning herbs and sacrificing a sheep.

The tokoloshe is said to have been brought to Basutoland by the Batembu tribe people, easily distinguished as they cut off the terminal phalanx of the left small finger of children soon after birth. It is said that before the advent of the Batembu the women of Basutoland used baboons as horses, but when the Batembu arrived the baboons died out and the tokoloshe came. A native under the influence of the tokoloshe has been described to me as follows: "His body becomes soft and useless. He will not answer when spoken to, but when walking will speak to himself. He may laugh but will deny laughter. Sometimes he will eat, but sometimes he may refuse because of the tokoloshe. He can see the tokoloshe, but is afraid to tell people. He may kill somebody by order of the tokoloshe, or the tokoloshe may kill him, or he may wander away never to be seen again. This state may last one or two months and then he gets better and may tell what happened to him."

Dreams, which are usually interpreted literally by these people, may also be influenced by the tokoloshe. If one dreams of water or crossing a river, of Europeans, of being bitten by snakes or chased by dogs or horses, of a terrifying sight, or if one

cries out during sleep, then the tokoloshe's influence is at work and one must consult the witchdoctor. The tokoloshe works by instilling a poisonous medicine called "Hophatsa" through a minute, undetectable wound in the skin. To cause death "Sejeso," an especially strong preparation, is used. Snake fat is especially feared by the tokoloshe as the fat is impervious to medicines and is therefore used as a protective anointing.

These primitive people with their almost animistic philosophy live under the control and guidance of the witchdoctor. All situations, both natural and unnatural, from delivery at birth, instruction and teaching of laws, marriage, pregnancy and death come under the witchdoctor's influence.

They are recruited into the army by their chiefs, who have been told to supply a certain number of men. Owing to their unswerving loyalty and strong tribal spirit they never refuse the call. They are mainly employed on routine labouring and dock work, but others are on gunnery duties or used as medical orderlies. Their new life of intensive training and discipline, without the possibility of any personal prominence and the necessity of subordinating their own wishes is a complete contrast to their carefree, lethargic, lackadaisical village life. Whereas before each man lived as his own master, tilling his own land, now he becomes a small cog in the machinery of the army, where tribal relationship and positions may be completely reversed. The chief's son may be a private and the peasant boy a sergeant—for the efficiency of the army must take priority over customs and taboos.

Hysteria: Motor and Sensory.

The motor manifestations occur on a dramatic and severe scale, and are initiated by trauma or physical illness which has run a prolonged course and necessitated repeated examinations; extremely gross in character, they are much as would be expected in primitive thinking peoples as being consistent with physical disease.

Starting in the manner of the traumatic compensation hysterical manifestations, the mechanisms are of a simple type, joint swellings leading to paralysis of limbs, injury to the back to camptocormia, a subphrenic abscess to gross scoliosis. Anaesthesia, usually total and affecting as much as half the body occurs more frequently than hyperaesthesia. As they are suggestible to a degree, new symptoms may be added easily during examination and changes in gait from day to day are extremely common. The "belle indifférence" is in no people better illustrated, a cheerful grin never being far away when discussing their symptoms. I have never seen tic or tremor in these patients.

Case 1.—The patient, an intelligent young lad, aged 20, was admitted to hospital with paralysis of his right arm and right leg. Since leaving his native land he had suffered from typhus fever, bronchitis and chicken-pox, and subsequently traumatic synovitis of his right wrist and right hip.

He first developed a dropped wrist and then a complete flaccidity of his right arm and right leg. His limbs were completely hypotonic and anaesthetic. Examination of the C.N.S. was negative. He was cheerful and lucid when telling the story of his afflictions. He stated that white doctors could not cure him, and he wished to return home where a native doctor would certainly find a remedy. He said it was better to lose his life than suffer this sickness, which he attributed to poisoning by men in his company, who were jealous of him. He made two exceedingly dramatic pretences at suicide, carefully packing his clothes and writing his last letters home.

He was treated with electrical convulsion therapy and his paralysis disappeared overnight. He then became extremely hypochondriacal, wheezing and complaining of his stomach. He showed little emotional control and gave way to bouts of crying and frenzy. His change from a cheerful bedridden paralytic to an unhappy dejected-looking emotional hysteric was extremely dramatic.

Case 2.—This patient, aged 30, was admitted from a hospital where he had been undergoing treatment for nasal obstruction. He had developed malaria during his treatment and later acute bronchitis. He complained of devils running about his head and limbs. His legs became spastic, and he could walk only with difficulty and the aid of a stick. The spasticity increased and he was unable to walk more than a few steps. The Kahn test was positive in his blood, but his

C.S.F. was normal. His C.N.S. showed no abnormality beyond exaggeration of all reflexes. Sensation was normal.

He stood upright on his toes and walked with a peculiar swinging gait, his hands resting on his thighs.

He was treated by means of re-education with walking exercises, and improved in rapid fashion, being able to return to duty after three weeks.

The mechanism was probably a kind of response to the rigors experienced in the course of his malaria.

CASE 3.—This patient, a left-handed man, sustained an injury to his left scapula by falling. He developed a hysterical contracture of his left elbow-joint. He was given pentothal and his arm straightened. On recovery from pentothal he became very emotional, ran screaming through the ward, rushed outside, commenced to eat the sand, and threw himself about. He quietened down, but his contracture returned.

A similar reaction occurred when sterile water was injected into his scapula at the site of the injury. By suggestion he was encouraged to straighten his arm. His face expressing severe pain and beads of perspiration appearing on his forehead, he eventually succeeded in pushing his left forearm out with his right hand.

HYSTERIA: SENSORY.

CASE 4.—This patient had complained of snakes causing pain in his stomach, loss of appetite, nausea and loss of weight. On examination he was seen to be wearing a tight cord round his abdomen. This he explained was to prevent snakes leaving his stomach and travelling to his head. He had been X-rayed and investigated for tape-worm, but nothing abnormal was discovered.

His history showed that his father had died recently and his mother had hinted that she might marry again. He was a simple immature dependent type, of below average intelligence, who found difficulty in adjusting himself to army life and found relief in his hysterical symptoms.

HYSTERICAL FITS.

These are always associated with an easily recognizable conflict, and in many cases associated with temper, tantrums, behaviour disorders with singing and shouting. The mishandling and interference of onlookers who attempt restraint renders diagnosis from epileptic states difficult. The invariable presence of a precipitating cause combined with a careful history of the course of the fit simplifies the diagnosis, and confirmation is always attempted with a phrenazol threshold test.

HYSTERICAL STUPOR.

CASE 5.—At the age of 14 the patient started work while at the same time his grandfather died. His grandfather, he stated, had been bewitched and the spirits later passed into his own body. He was treated by a witchdoctor with native medicine and was cured. He was unable to give any definite symptoms, but just stated he had been bewitched and was very ill. He had taken medicine at various times from different witchdoctors, and considered that mixing the medicines had caused discord amongst the spirits in his body.

He was serving in Tripoli as a batman and was exposed to extremely heavy bombing raids. The spirits then began to attack him again at this time. He stated that he was not afraid of the bombing raids. He sang and shouted to drive the spirits away. He became torpid and content to lie on his bed all day. His face was expressionless; he would not speak. This proved to be a gross dissociated state of clouded consciousness of a hysterical type due to exposure to severe stress. When he was told he would be returning to his unit, he became noisy and restless, and had violent outbursts of hitting his head. His restless condition persisted, with sudden outbursts of animal-like cries and croup-like breathing. After a short while he relapsed into his stuporose condition. He was boarded for evacuation and made a complete and uninterrupted recovery until told one day that he had developed scabies, which would mean isolation from his friends. He ran out of the consulting room and made a dive at the wall, inflicting a small scalp wound. He began once again his croup-like breathing and emitting of strange sounds. Placed

in bed he was stuporose and dissociated for a few hours, but the next day became normal again when he was told that isolation was no longer necessary.

CASE 6.—This patient complained of generalized aches and pains. He had had intercourse in June, 1943, and developed gonorrhoea. His platoon sergeant had had intercourse with the same girl on the same evening, but did not develop gonorrhoea.

As the sergeant had handed the patient a drink of water and a cigarette when they had finished he attributed his sickness to being bewitched. He stated: "The doctor tells me I am fit for duty while I am very sick and I think that the disease which the sergeant gave me is unknown to the white doctor."

His history showed he had been married earlier in the year. He exhibited gross guilt feelings about his illicit intercourse and subsequent venereal infection.

He was admitted to hospital in a stuporose, semi-comatose state. Grossly dissociated, he was content to lie on his bed quietly most of the day and had to be encouraged to eat. On the second day he was still strange in manner and muttered and whimpered when a newcomer came into the ward. After a few hours he became very emotional, wept profusely and his pains disappeared. He became far more cheerful after being treated with E.C.T., and told that he would be returning to his unit. He later became aggressive, attacked two other patients, was very emotional and theatrical.

HYSTERICAL PERSONALITY.

The theatrical personality type is extremely common. In these, personal prominence is impossible in the native's new life, and lack of sympathy combined with a feeling of insecurity serve also as precipitating factors for illness.

CASE 7.—The patient joined a new company as a bright, cheerful, happy-go-lucky man. He became unhappy and oppressed as he was the only member of his tribe in this company. He wandered from tent to tent with all his kit at night. If checked, he would scream and shout for the guard to come and protect him.

He walked in a most peculiar fashion, changing and varying his gait, and was extremely noisy. His body was twisted and contorted, changing its shape often. He performed various antics, chattering, laughing loudly and mimicking people. He was removed to hospital and settled down as soon as he met members of his own tribe, becoming cheerful and happy once again. His love of self-display was evident, as he would greet each visiting officer to the ward with a native dance called "Kasinjet." If ignored on ward rounds he became very sulky, petulant and unhappy until brought into the limelight once more.

PHOBIC STATES.

These cases show a regression to childish behaviour combined with very primitive thinking. Unpleasant situations are invariably found to be present and are dealt with on this primitive and infantile level.

The tokoloshe, the small black ugly dwarf with its body covered with hair, figures prominently in these fear reaction states. This legendary bogy man of childhood is associated with sensations of choking and headaches, while depression, in cases with guilt feelings, is a prominent feature. The mental defective and the more simpler type are especially prone to this type of disorder, and in combination with gross hysterical behaviour resemble superficially the schizophrenic patient.

CASE 8.—Whilst road making at Tobruk this patient complained of inability to sleep at night. He stated that when he went to bed a dwarf would come and attempt to seduce him. The dwarf was about two feet tall, had hair over its body, had an ugly face and was female. She went for his throat as he refused to have anything to do with her. He could not fight against her without special medicine, and so had to run from his bed in an attempt to escape.

The dwarf had been purchased by a woman whom he had loved and had intended marrying. His parents, unfortunately for him, had chosen another girl to be his wife. He still loved the original girl. He was a simple man who had undergone severe bombing raids. He stated that he was not afraid of the bombs, but had never heard so much noise in his life. The noise would not permit him to work, so he had to run away. He undoubtedly had been very shaken, although he would not admit it.

This was a phobic state precipitated by intense bombing. A choking sensation with severe headaches was interpreted as an attack by the "tokoloshe." Feelings of guilt over his late girl friend led to the belief that she had purchased the dwarf and sent it from Basutoland to North Africa in revenge for the treatment she had received from him.

He settled down and improved with E.C.T.

CASE 9.—Death in the family makes it obligatory for all near relatives to be present at the funeral. For the dead man's soul to rest in peace all direct male members must be present to throw soil over the coffin, to cut off their hair, to wear black and render sacrifices. A similar ceremony usually occurs one year after death.

The patient received notification by letter of the death of his father. He complained of being pestered by a dwarf which appeared to him in a threatening manner and asked him what he was doing away from home. The spirit, he knew, would not let him rest until he returned home to look after his mother. From being a happy, gay and carefree man his personality changed. He became petulant, sullen, refusing to work or obey orders and attempting to run away from the camp to escape from the dwarf.

This was a phobic state due to his inability to carry out his funeral obligations, to look after his mother, and also to the primitive fear of the dead which necessitates appeasement of the dead man by mourning and sacrifice.

TREATMENT.

An established routine is used in treatment of hysterics in these natives. The patient is interviewed as soon after admission as possible. One complete and thorough physical examination is carried out. Routine Kahn is always taken, and lumbar puncture when the blood is positive or trypanosomiasis is to be excluded.

As early as possible suggestion and persuasion with, if necessary, pentothal or ether narcosis is used, and in all cases of functional motor paralysis, remedial exercises following convulsion therapy, either chemical or electrical, are found useful later. Route marches, physical exercises and games, combined with occupational therapy and ward work help in their rehabilitation and readjustment to army life.

Whenever possible, men are kept with their own tribal groups, and competitive games, such as "Morabaraba," group singing and dancing encouraged. Care in their dress and personal cleanliness is insisted on and morale kept as high as possible by attention to monetary and welfare matters, writing of letters home for the illiterate and exceptionally sympathetic patient handling.

Well trained, interested medical orderlies are of paramount importance, and it has been found that native orderlies working with their own tribes are particularly useful.

The native has such a profound respect for the magical powers of medicines that medical treatment when given is made as dramatic as possible. One such patient, complaining of functional eye pains, was treated by instilling bland drops into the eyes and methylene blue capsules by mouth. It was suggested that the spirits would be driven out of his eyes into his urine, and the patient proved profoundly impressed by the blue urine which washed away his symptoms.

Of all types of hysterical cases seen 60 per cent. were returned fit for duty within 10–14 days. 80 per cent. of motor hysteria cases were returned cured. Many of the remaining 40 per cent. of hysterics regraded as unfit were complicated by varying degrees of mental deficiency, and although relieved of their symptoms their liability and proneness to relapse rendered them unfit for further service.

DIFFERENTIAL DIAGNOSIS.

In those of low intelligence, states of clouded consciousness, primitive thinking and childish behaviour renders differential diagnosis from schizophrenia difficult. Careful and painstaking elucidation and interpretation of what they say combined with a knowledge of their normal beliefs to allow a correct assessment is essential.

The description of an illness as due to poisoning by medicines, or snakes introduced into the food by an enemy, or the sending of spirits, from their native lands thousands of miles away, to persecute them may stimulate paranoid delusions. The wish is often projected, and "I want to go home" becomes "I hear a voice calling me home." Their acceptance of telepathy, and when the past is not differentiated from the present and dreams are interpreted literally, makes skilled

interpretation essential to differentiate their symptoms from those of the schizophrenic. Primitive man thinks visually, and to him the thought is the deed.

Stupor in the hysteric, although common in these people, is never so profound or prolonged. A craving for sympathy and attention is so strong that the hysterical mute cannot accept being ignored for long. One patient, ignored for three days on ward rounds, suddenly burst forth into vulgar abuse complaining that no attention was paid to him.

The gross apathy and the general picture of the schizophrenic is the same as in Europeans. Consideration of the general behaviour in all fields and the complete recovery after removal of precipitatory stress confirms satisfactorily the diagnosis of hysteria.

Depression occurring in phobic cases or in the chronic and intractable motor paralysis, where the secondary desire to go home has arisen, are never sustained or of psychotic character. Classical cases of mania are rare in these patients, and the states of excitement in hysterics show neither the flight of ideas, distractibility or prolonged elated mood.

The absence of true anxiety states is striking, for although observed in natives of Mauritius, Singalese and Cape coloured personnel, I have never seen a case amongst these more primitive races. The tremulous sweating patient, with his vague changing fears and complaints of disturbance of his respiratory, digestive and circulatory organs is not seen. The primitive method of thinking by visual imagery with externalization and projection of emotion with its attachment to an external object is in my opinion the reason why the anxiety state is an unnecessary or impossible reaction.

A knowledge of the native's normal beliefs is, of course, essential, for his explanation of organic pain in terms of animals, witchcraft, devils and magic may lead to an assumption of functional disease in an organic illness.

Conclusion.

1. The African natives, secure, peaceful and safe, living under a simple system with strong family and tribal ties, are sent into the army—an unknown world and a complete change of environment, full of danger.

Intensive training, discipline and routine increases and heightens their already great suggestibility and proneness to hysteria. Their lack of education leads to the dramatic and gross expression of symptoms.

2. Except in the dramatic severity of expression, hysteria in natives is similar to that occurring in Europeans when primitive behaviour and beliefs are accounted and allowed for.

3. The early recognition of an hysterical overlay in physical diseases, especially of the limbs, cannot be too strongly emphasized. The suggesting of symptoms or signs in cases requiring repeated physical examination must be avoided.

4. Differential diagnosis from manic-depressive psychosis and even schizophrenia is not difficult when careful observation is carried out with adequate knowledge of their environmental and cultural background.

5. Symptoms must be evaluated in relation to their normal primitive beliefs, and recognition of the natives' ordinary description of organic disease is essential.

6. Intelligence tests comparable with the Raven Matrix are still under trial. The mental defective, as judged on normal everyday standards, is, however, certainly useless to the Army. This simplicity and proneness to hysteria associated with phobias renders him a serious liability.

7. Their readiness to respond to kindly forms of treatment and suggestion is remarkable. Sympathetic understanding, therefore, of the Africans' problems on the part of European Officers and N.C.O.'s and a knowledge of how they can be best handled and assisted with their army and home difficulties as they occur will not only increase their efficiency, but will also act as a potent prophylactic measure, against neurotic, particularly hysterical breakdown.

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THE NEUROTIC DYSPEPTIC SOLDIER.

By S. D. MITCHELL, M.B., D.P.M.,
Psychiatrist, E.M.S.,
AND
C. S. MULLIN, M.D.,
Lieut., U.S. Navy, formerly Psychiatrist, E.M.S.

RECENT observers have differed considerably as to the incidence of neurosis among dyspeptics in the services. Whereas Hinds-Howell (1) only found about 8 per cent. of neurotic dyspepsia in a group of cases, Hartfall (2) considered that 60 per cent. of his cases, with or without ulcers, had a neurotic basis. A leading article in the *Lancet* on June 20, 1942 (3), stated that dyspepsia is often a manifestation of neurosis, that anxiety neurotic features are frequently associated, and that most patients are constitutional neuropaths.

We have made a psychiatric survey of 50 soldiers with prominent gastric symptoms, who were in-patients at an E.M.S. Neurosis Unit between April, 1942, and July, 1943.

No relevant organic disease was found; 37 were referred to medical specialists, and barium meal X-rays were carried out on 45. A control study employing similar methods of investigation was made on 100 neurotic soldiers in whom gastric symptoms were inconspicuous or absent. Evidence of autonomic imbalance was common in both groups, e.g. fine tremor of outstretched hands, flickering of closed lids, increased pulse-rate, and free sweating. No particular type of build predominated. All the soldiers were "other ranks," mostly of Army Class. The average age of the gastric cases was 27·5 years, and of the controls 30·2 years. Whilst the intelligence levels varied from dull to superior, the intelligence of the majority in both groups was average:

Gastric symptoms were generally vague and variable in character and combination. A few features, however, deserve notice:

(1) Pain often came on from half to one hour after meals, frequently immediately on taking a meal. It was usually dull, and not relieved by taking more food.

(2) Nausea and/or vomiting were common.

(3) Alkalis and vomiting were variable in the relief they caused.

(4) Emotional factors—fear, worry, excitement—and also exertion often brought on or made symptoms worse, especially pain.

(5) There was a tendency to select diet, and particularly to avoid fatty foods.

(6) Appetite was generally good, but bulimia rare.

Gastric symptoms had been conspicuous in 86 per cent. of the gastric neurotics before joining the army, and appeared to have become definitely worse in 44 per cent. of these within three months of joining.

Many gross neurotic traits were evident in the past and present histories. The following forming part of the complaint on admission were much more frequent than in the controls:

	Gastrics.	Controls.
Morbid anxiety	92%	61·5%
Depression	76%	36·5%
Poor concentration	28%	12·5%
Dizziness	30%	12%
Cardiovascular and respiratory symptoms, e.g. precordial pain and dyspnoea	56%	21·5%

The average period of Army service since the outbreak of war was 2 years 2½ months in gastrics and controls.

Army efficiency prior to breakdown (charitably estimated) had been poor in 34 per cent., fair in 54 per cent., and good in 12 per cent. of gastrics, as compared with 18 per cent., 27 per cent., and 55 per cent. respectively in controls. Overseas service, mainly in France, had been experienced by 12 per cent. of gastrics and 20 per cent. of controls.

Examination of the past history showed the following evident differences :

	Gastrics.	Controls.
Some degree of stomach trouble for many years	52%	27%
Frequent vomiting when emotionally upset	30%	21%
,, fainting	36%	22%
,, dizziness	36%	28·5%
Timidity	62%	42%
Solitariness	54%	39·5%
Frequent nightmares in childhood	56%	27·5%
Marked childhood fears (of the dark, animals, etc.)	72%	51·5%
Unnecessarily frequent rechecking of common actions (turning off lights, shutting doors, etc.)	44%	15%

A questionnaire was also sent to the mothers or near relatives who had known the gastric patients in childhood. Enquiries about breast-feeding showed that 5 patients had had weaning difficulties, and one had "refused" the breast at birth. 38 per cent. of the 50 patients had vomited easily when upset and 44 per cent. had been very "fussy" about food. The very high figure of 74 per cent. of gastric disorder occurred in one or more of the immediate family. This compares with only 5 per cent. in the controls, and in three-fifths of these the patients themselves complained of stomach trouble as a minor symptom on admission to the hospital. In one of the gastrics' family history, father, mother and four of six brothers (there were no sisters) had suffered from chronic stomach trouble. The father suffered from ulceration and a perforation. Three brothers had been operated on for ulcers, one four times. The following other features of the family background are of interest:

	Gastrics.	Controls.
Mother obviously neurotic	66%	40%
Father obviously neurotic	54%	20%
One or more siblings obviously neurotic	68%	31·5%
Obviously over-strong mother-son relationship	44%	30·5
Marked childhood fear of father	34%	23%
,, parental friction	26%	11·5%

From a general survey of the patients *predisposition to neurotic breakdown* was considered to be marked in 12 per cent. and moderate in 88 per cent. of gastrics. In the controls it was marked in 9 per cent., moderate in 59 per cent., slight in 17 per cent. and not evident in 15 per cent. Amongst the *precipitating factors in breakdown* in both gastrics and controls, two, as expected, stood out predominantly. These were homesickness and inability to adapt emotionally to the conditions of army life. To some degree these appeared to have been present in most patients, and especially in the gastrics. The factor of recent worry about near relatives is difficult to assess. It is not necessarily pathological, and the neurotic often uses it as a justification after the event, his main concern so commonly being with himself. A recent appendicectomy had been a precipitating factor in the breakdown of four gastrics. Other difficulties, e.g. injury, intercurrent illnesses, exposure to enemy action at home or abroad and matrimonial disharmony played only a very small part in our series. It would, therefore, appear that the constitutional

neurotic factor was highly predominant. A markedly dependent attitude to life was present in 70 per cent. of the gastrics. At least 75 per cent. of the gastrics had had satisfactory civilian work records. 78 per cent. of them were married, and 70 per cent. of these appeared to have had happy married lives. They had adapted fairly well to life in comparatively sheltered circumstances, but broke down in the army. We conclude this section with two case-histories.

A signalman, aged 33, complained of dull pain just below the umbilicus about half an hour after meals ever since childhood. It had been worse for two years—since he had been worrying about his wife giving birth to a child of which he was not the father. She went to live with the other man, taking his little girl of 8 with her. A divorce was pending. He also complained of headache since joining the army, feeling miserable and unsociable for 18 months and insomnia for 6 months. He had volunteered for the army owing to the domestic trouble 2½ years before. He fainted on parade from fear of making mistakes in his first week, and remained full of fears. Had been employed mainly on light duties. His family history showed that his mother, who suffered from recurrent depression, died when he was 9 from gastric ulcer. His father married again, and his stepmother disliked his father's three children by his first wife. The father supported her attitude. There were two step-sisters, with whom the patient repeatedly quarrelled. The patient and his two brothers—he was the youngest—finally left home when he was twenty. The stepmother was removed to a mental hospital with delusions of persecution 18 months before he was admitted to our unit. The maternal grandmother, who lived with them, became violent and also had to go to a mental hospital as an old woman. The patient felt when he was a child that there was "all illness" in the house, and he was also looked on as delicate by both parents. He was not allowed to play games or swim in case he got hurt. He has always been very scared of the dark, and as a child frequently sleep-walked and had many nightmares of falling. At school he had been very shy and quiet, and poor at standing up for himself. On leaving school he did a number of odd jobs, though for three years before joining up had averaged £8 a week on assembly work with a motor car firm.

In hospital he was found to be of average intelligence. His barium meal X-ray showed no lesion. He remained mildly depressed and tremulous and was recommended for discharge from the army. A follow-up questionnaire a year later showed that his general condition was unchanged, and that he was working as a warehouseman, only earning £3 10s. a week, after giving up a factory post at a better salary because of intolerance of noise and depression. He had taken no further steps about his divorce.

The second patient, a private, aged 22, gave a four years' history of a feeling of his stomach turning over, "like when you are frightened," coming on about 1½ hours after meals. It also was sometimes associated with headache and dizziness. In addition he sometimes vomited food about 20 minutes later. Just before joining the army three years earlier he began having headaches "together with the heart-beats," and these had continued. For a similar period he had felt miserable, unsociable, tense, and restless. His recent memory and concentration had been poor, but energy good. He had originally joined the Supplementary Reserve with others in his firm in August, 1938, and was called up at outbreak of war as a fitter, but was merely employed on odd jobs. Was categorized C for neurasthenia and dyspepsia in April, 1940. Was always very upset by rules and regulations, frightened of the dark on guard, scared of the noise of firing, and when a raid was on had to remain stationary and trembled all over. Had had punishments for absence without leave owing to homesickness and for striking an N.C.O. who criticized his work. His father was invalided out of the army with gastric ulcer and his mother was a life-long sufferer from asthma. His mother stated that he was breast-fed and weaned at 9 months, but there was difficulty in finding suitable food for the next three months. Then at 2 he had a period of vomiting, and in childhood often refused cooked meals, saying they made him feel sick. He was the second of nine children, and his parents also adopted a boy of 7, who patient preferred to his siblings. He was enuretic most nights until 8, and as a child had frequent nightmares of falling or passing water. At school he made no friends, and lost about two months every year through bronchitis. He played no games for fear of being hurt and was poor at standing up for himself. All his life had been easily disheartened, dizzy on heights, and scared in crowds and narrow spaces. He had always been very violent tempered, and had had counting and cleanliness compulsions for many years. He had been happily married for three years, and had worked apparently competently and with great interest in civilian life as an apprentice fitter. Four months before admission a medical specialist had found no organic disease, including barium meal X-ray examination. In hospital he was found to be of good average intelligence and on admission was moderately depressed. His gastric symptoms improved somewhat and he became more sociable, but his attitude remained slightly paranoid and his morale poor. He was recommended for discharge.

A follow-up 14 months later showed that he had made slight general improvement at first, but he had finally given up his skilled work and was thinking of taking outdoor work, at which his prospects were much poorer.

Diagnosis.

Neurotic patients in general show a variety of neurotic trends. We apply the term " diagnosis " to the most prominent features of the illness at the time we saw the patient. Our classifications of the gastrics were as follows :

Anxiety neurosis	68%
,, ,, with marked obsessional trends	20%
,, ,, with hysterical marked trends.	4%
Depressive neurosis	6%
Hysteria	2%

Treatment.

We agree with Morton Gill *et al.* (4), Stungo and Charlton (5), etc., that long stay in hospital is very uneconomical and a worsening factor in prognosis. We found that the average period in hospitals prior to admission was six weeks in our gastrics, five of which had been for stomach symptoms. In the controls it was 3·7 weeks. We first excluded from these figures visits to M.O.'s, out-patients, and periods in Camp Reception Stations and hospitals abroad awaiting transfer to the United Kingdom. Injuries were also excepted, though it is well known that a number are psychologically determined. Also when " organic " illness occurs in many neurotics, the convalescent period is unduly prolonged. In our unit each patient was treated primarily for his neurosis. The main lines, as elsewhere, consisted of psychotherapy, occupational therapy and drugs as indicated. Exercises were graduated, with preliminary rest in bed, where necessary. A psychiatric social worker gave valuable additional help. We did not actually have occasion to use such other psychiatric methods as continuous narcosis, but found small increasing doses of insulin very helpful to improve appetite, weight and general condition.

Dietetic measures or gastric mixtures were rarely advised. It is quite impossible for those who return to the army to be treated systematically on these lines.

We tried to persuade all our patients to avoid these measures. It was, however, felt that most of them in or out of the army would become periodical visitors to the doctor or chemist for a " bottle " or would treat themselves. In this they would resemble the gastric neurotic so familiar to all general practitioners.

Method of Disposal.

Whilst a number of mild gastric neurotics are doubtless able to remain efficient in the army in relatively protected work without ever coming to the notice of the medical specialist or psychiatrist, we felt obliged to recommend 80 per cent. of our patients for discharge. The same percentage of controls was also recommended for discharge. It may seem surprising that, whereas 55 per cent. of the controls had records of good army efficiency, as many as 80 per cent. of the whole were recommended for discharge. This is explained by the fact that most of this 55 per cent. managed to carry on relatively well, though gradually breaking down. In the end they were unable to recover sufficiently to give further service. More marked evidence of the inefficiency of most gastrics is obtained by comparison with the discharge recommendations for all neuroses at our Unit between January 1, 1942, and June 30, 1943. These amounted to 64 per cent. Change of employment was recommended in one-third of the 20 per cent. of gastrics returned to the army. The Annexure A scheme for employment in a specific trade was utilized for two patients. Follow-ups sent to M.O.'s elicited replies in 90 per cent.

In only one case was a report obtainable after 12 months, and this man was performing full duty efficiently and willingly as a draughtsman. Replies received after an average of six months for the remainder showed that with one exception they were performing full duty efficiently and willingly and the exception was moderately efficient at light duty.

However, in most cases there had been complaints of gastric or other neurotic

symptoms, and one patient had had a further two weeks' hospitalization for his stomach.

A questionnaire was also sent to the 80 per cent. of gastrics discharged from the army after an average period of 12 months. Replies were only received from 42·5 per cent. Allowing for the limited value of the questionnaire these conformed to the general impression that the neurotic is very slow to return to his pre-army level of mental health and work efficiency.

To sum up, we agree with J. R. Rees (6) that in general, neurotic soldiers with frequent gastric symptoms have a bad prognosis.

Summary.

1. A psychiatric survey was made of 50 soldiers with prominent gastric symptoms but no relevant organic disease, who were in-patients at an E.M.S. Neurosis Unit.

2. A control study was made of a series of neurotic soldiers, in whom gastric symptoms were inconspicuous or absent.

3. The gastric symptoms were generally vague in description and variable in character and combination. A few features, however, deserved notice, e.g. relationship to emotional stress and exertion.

Gastric symptoms had been conspicuous in 86 per cent. of the "gastrics" before joining, and appeared to have become worse in 44 per cent. of these within three months of so doing.

4. Army efficiency in the gastrics had been much poorer as a whole than in the controls.

5. Many gross neurotic traits were evident in the family, past and present histories of gastrics and controls, but a number of these were much more prominent in the gastrics.

6. 74 per cent. of gastrics gave a history of gastric disorder in one or more members of the immediate family as compared with 5 per cent. of controls.

7. 75 per cent. of the gastrics had had satisfactory civilian work records. 78 per cent. of them were married and 70 per cent. of these appeared to have had happy married lives. They had adapted comparatively satisfactorily to fairly sheltered lives.

8. A markedly dependent attitude to life was present in 70 per cent. of the gastrics.

9. Homesickness and inability to adapt emotionally to the conditions of army life were the main precipitating factors in ultimate breakdown in both gastrics and controls.

10. A diagnosis of anxiety-neurosis was made in 68 per cent. of gastrics, and anxiety neurotic features were very prominent in a further 24 per cent.

11. The disadvantages of long stay in hospital and the part it played in our patients' histories are reviewed.

12. 80 per cent. of gastrics were recommended after treatment for discharge, as compared with 64 per cent. of all patients at our Unit over a corresponding period.

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DEATH FROM ELECTRICAL CONVULSION THERAPY.

By F. J. Napier, M.R.C.S., D.P.M.,
Deputy Medical Superintendent, Carlton Hayes Hospital, Leicestershire.

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Ten years have elapsed since the introduction by Meduna in 1934 of convulsion therapy, and five since Cerletti and Bini first described the use of electricity as a convulsant. A not unreasonable early prejudice finds a later echo in the comment of Critchley (1943) that convulsion therapy " is crude, dangerous and repellent to anyone who holds the central nervous system in respect."

Nevertheless, the experience of the decade has established that convulsion therapy comes near to providing a specific treatment for the affective psychoses. Batt (1943) quotes a recovery-rate of 87 per cent. from a series of a hundred depressives of different types; Fitzgerald (1943) reports 78 per cent. recovered out of 150 patients suffering from depressive states. It is a remarkable advance that a type of case in which the outlook was formerly so problematical can now be offered with some confidence the prospect of restoration in a matter of weeks.

Successive observers have described the advantages of electrical convulsion therapy (E.C.T.) over other forms of induced convulsion. Greater freedom from complications, of which the chief are fractures and dislocations, and a lower mortality are among the conclusions of the recent comprehensive survey by Cook (1944). Kolb and Vogel (1942), who are responsible for the most considerable American analysis, record 4 deaths in 7,207 electrically treated cases, a rate of 0·05 per cent., which compares with the figure of 0·1 per cent. for cardiazol cases.

No similar series has appeared from English hospitals, and as the deaths that have occurred have been so few, no individual experience can for a long time be large enough to give a valid rate, nor do the published figures of treated cases amount as yet to a total in any way comparable with that of Kolb and Vogel.

As a step therefore towards assessing the position for this country, it was thought to be of value to record the deaths that have already occurred. Only one of these (Batt, 1943) has been published, and an otherwise fairly voluminous literature is thus short of one important particular.

E.C.T. is carried out in public and private mental hospitals, in out-patient departments and in service establishments. Cases from the first group will form by far the largest number for obvious reasons, and any deaths in this group are automatically reported to the Board of Control, who were good enough to inform me of four of these. The cases here recorded therefore would appear to be the only known civilian deaths that have as yet resulted from E.C.T. in England and Wales. Two have been personally observed. Two more have been most kindly communicated by the medical superintendents concerned. The fifth has been published. A sixth was reported to the Board of Control, but is to form part of a later compilation and no details are available.

Cases.

(1) A. C. H—, male, aged 46, admitted 23.ix.41. Complaining of depression, insomnia and widespread pains.

History.—" Shellshock and gas " in last war. " Graves' disease " 1920. Unemployed for last 21 years.

On examination.—Poor physique, pallid and with a number of physical complaints, none of which were based on demonstrable physical disease. No exophthalmos, no thyroid enlargement, no signs of thyrotoxicosis.

Course.—No response to simple psychotherapy and no spontaneous improvement at six months.

E.C.T.—31.iii.42, 11.30 a.m.: 150 volts, 0·2 second. Satisfactory convulsion without unusual features. Normal recovery over subsequent half hour. Walked back to his own ward for midday meal, only complaining of slight malaise, as is not infrequent in the immediate post-convulsive phase. At about 4.30 p.m. he was noticed to be rather restless, but he made no further complaint, nor were his manner and appearance in any way altered. At 5.30 p.m. he complained of dyspnoea, and died in his chair at about 5.40 p.m. There was then seen to be some fullness of the lower neck anteriorly, and this area later showed a subcutaneous deep shadow.

Post-mortem, 1.iv.42.—Brain and cord showed no abnormality beyond a cystic choroid plexus. On opening the neck and thorax an extensive spreading haemorrhage occupied the region of both thyroid lobes, reaching posteriorly and across the isthmus; further spread downwards into mediastinum, surrounding trachea, oesophagus and great vessels. Right lobe of thyroid showed some recognizable thyroid tissue, much disorganized; left lobe entirely disorganized by blood-clot macroscopically. Retrosternal mass of clot contained some glandular tissue, much disorganized and unrecognizable by naked eye. Epiglottis, arytaenoids and larynx showed much jelly-like oedema, with injection of trachea but no froth or vomitus. No petechiae on epicardium or liver. Heart showed increase of subepicardial fat, but otherwise normal. No other relevant findings.

Sections of thyroid lobes: Normal thyroid tissue, without alveolar proliferation or colloid excess; widespread haemorrhages. The retrosternal mass consisted microscopically of clearly recognizable thymus and blood-clot.

It was not possible to identify the source of the bleeding, though it can hardly have been other than in the thyroid venous plexus. So also it remains conjecture that the onset of the bleeding was in the congestive phase of the convulsion, though no other explanation is tenable. In the absence of signs of asphyxia, death would appear to have been caused by mediastinal shock before the closure of the glottis by oedema could occur.

(2) M. A. D—, housewife, married, aged 52, admitted 11.xii.40. Involutional depression.

History.—Agitated depression of four years' standing.

On examination.—Small, poorly nourished woman; no important physical findings. Deeply depressed, agitated, self-absorbed and almost entirely inaccessible.

Course.—No spontaneous improvement in further two years—a total of six years in hospital. Not confined to bed.

E.C.T.—15.iv.42: 120 volts, 0·15 second. Satisfactory convulsion with no unusual features. Recovery normal. Afterwards access was very slightly improved and she answered questions in a whispered voice.

17.iv.42: 120 volts, 0·15 second. No convulsion. Short interval and 150 volts, 0·2 second. Satisfactory convulsion with no unusual features. Recovered normally, but then complained of inability to walk and pain in the right hip. X-ray showed fracture of floor of right acetabulum, with medial displacement of an elongated fragment. Femoral neck intact. Treated by extension in abduction. Mentally she showed further improvement and was more accessible, though still deeply depressed. Subsequently her condition deteriorated and she developed signs of pulmonary tuberculosis. She died on 21.x.42, six months after E.C.T. and the injury.

Post-mortem, 22.x.42.—Confluent tuberculous foci in both lungs, most pronounced in the left upper lobe. Fracture of right acetabulum; the head of the femur could be palpated from inside the true pelvis.

Cause of death: Pulmonary tuberculosis; fracture of pelvis.

(3) B. C. M. H—, male, aged 62, admitted 26.x.42. Anxious hypochondriacal depression. Ideas of suicide, of venereal disease, of punishment for his venereal disease.

History.—First attack of depression.

On examination.—Peripheral arteries soft. B.P. 185/90. Slight enlargement of the left ventricle; the heart-sounds of poor quality. No organic neurological signs. Blood W.R. negative. Urine 1010, acid, haze of albumen, pus-cells. 23.xi.42: Urine clear.

E.C.T.—11.i.43: Potentiometer 65, 0·25 second. Patient's resistance 4,000. No fit. Four further doses of electricity were given up to and including 21.i.43, with potentiometer at 95, time 0·35 second. Patient's resistance always high (3,000–5,000 ohms). No convulsion.

25.i.43: Potentiometer 95, 0·4 second, 5,000 ohms. A strong convulsion, the first and last, at 11.15 a.m., 5 seconds after the passage of the current. Condition during and after the fit not abnormal. He regained consciousness at 11.45 a.m. "Half an hour after the fit he displayed some excitement and restlessness, sat up in bed and collapsed; he became grey in colour, his pulse was imperceptible, his breathing stopped; the pupils were moderately dilated and did not react to light. Artificial respiration was started at once, heat was applied, the limbs were massaged and bandaged. He was given 1·0 c.c. of coramine, followed by 1·0 c.c. of adrenalin, and finally strophanthin into the heart. For a few seconds after this the pulse could be felt at the wrist. Artificial respiration was continued for 1½ hours without effect.

"*Post-mortem.*—Pia generally thickened and oedematous, haemorrhagic staining in the frontal region and, on the right side only, over the parietal and occipital regions. Basal arteries healthy except for some thickening of the right internal carotid and a patch of sclerosis at the lower end of the basilar. Apart from a degree of cortical atrophy there were no other notable changes.

"Heart: Somewhat globular in shape. Marked relative preponderance of the left ventricle.

All chambers empty. Valves healthy on the whole, though the mitral and aortic were more opaque than usual. Heart muscle was extremely soft, the thumb penetrating it easily.

"Aorta: Almost free from atheromatous changes. Pericardium showed a broad band-like adhesion about an inch long and nearly as wide between the posterior surface of the heart and the parietal pericardium.

"The remaining organs, including kidneys and bladder, showed no prominent abnormality."

Cause of death: Syncope due to myocardial degeneration.

(4) E. S. C. M. H—, female, aged 74.

History.—Manic-depressive illness of long standing.

E.C.T.—Following the third treatment with E.C.T. she was found to have a fracture of the neck of the right femur. Subsequent satisfactory progress, but on 31.xii.43 she showed signs of uraemia—blood urea 102 mgm. per cent.—and pulmonary congestion, and she died on 1.i.44.

Certified cause of death: (1) (*a*) Uraemia; (*b*) chronic nephritis. (2) Bronchopneumonia, cardiovascular degeneration, fracture of neck of right femur.

(5) (Quoted from Batt, 1943.) Female, aged 54. Manic-depressive. Six days after the second E.C.T. convulsion she developed bronchopneumonia and died four days later. Post-mortem showed bronchopneumonia and chronic nephritis.

Commentary.

Only in two of these cases is death directly referable to the convulsion, and of these Case 1 belongs to the group of rare and unpredictable vascular catastrophes. Haemorrhage into the thyroid is itself uncommon, and a fatal thyroid apoplexy exceedingly rare. Ryan (1942) quotes two comparable cases. In one a spontaneous haemorrhage ruptured through the capsule and infiltrated the fascial and muscle planes of the neck, spreading into the mediastinum as in the present case. The second recalls the mode of onset of Case 1. A man, aged 55, straining at defaecation, had sudden difficulty in swallowing, became dyspnoeic, unconscious, and died. A similar uncharted hazard is offered by the cerebral aneurysm.

Case 3, on the other hand, represents a group of cases where physical signs point definitely to an incalculable risk which it is only possible to cover by an attempt to induce the mildest type of convulsion. Where the threshold is normally high this is hardly possible. Nevertheless it is certain from personal experience and from many accounts in the literature that, though such fatalities could be reduced even further, it would be at the cost of excluding a number of poor risks who would otherwise benefit. Undoubtedly a policy of ruthless selection could achieve a very high rate of cure with a very low fatality- and complication-rate. Such a policy would ignore the constant risk to life from intercurrent infection or suicide, to which a chronic depression predisposes, as also the fruitlessness of a life maintained on such terms.

Cases 2 and 4 have much in common, though Case 2 also illustrates the possibility which has already been well established of lighting up old tuberculous foci by convulsion therapy of all forms. The diametrically opposed views of those who restrain and of those who avoid restraint show how little as yet the risk of fracture can be guarded against, and the occurrence in these two cases after the successful negotiation of one and two previous convulsions illustrates the element of chance in the development of a breaking strain.

Case 5 is admitted by the author to show no more than a temporal association, but he points out that if no proof of a relation can be adduced, there is none to exclude it.

Summary.

1. A record is given of six cases known to have died following electrical convulsion therapy.

2. Of these deaths, two arose directly out of the convulsion, three were associated deaths, and in one case the relation is not known.

3. These are believed to be the only civilian deaths from E.C.T. which have been met with in England and Wales.

I am indebted to Dr. K. K. Drury, Medical Superintendent of Carlton Hayes Hospital, for the use of case-material; to the Board of Control; and to Dr. Ian

Skottowe, Medical Superintendent, Bucks County Mental Hospital, and Dr. B. Reid, Medical Superintendent, East Sussex County Mental Hospital, who so kindly allowed me to make use of cases which had been under their care.

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Part II.—Bibliography and Epitome.*

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AM. J. PHYSIOL.

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Results of Prefrontal Lobectomy on Acquired and on Acquiring Correct Conditioned Differential Responses with Auditory, General Cutaneous and Optic Stimuli.

Dogs were conditioned to respond differentially to pairs of stimuli in three modalities. The results were compared before and after prefrontal lobectomy on several of the dogs. In general the extirpation produced no permanent effects on the conditioned responses or the conditioning process. T. G. ANDREWS (Psychol. Abstr.).

Distribution of Cortical Potentials Resulting from Insufflation of Vapors into the Nostrils and from Stimulation of the Olfactory Bulbs and the Pyriform Lobe.

When trigeminal and vagal stimulation had been eliminated and single shock stimulations of the olfactory bulbs or insufflations of odors into the nostrils were performed, action potentials from the pyriform lobe were obtained in dogs. "Single shock stimulation of the pyriform lobe evoked potentials from the ventrolateral portion of the prefrontal area and antidromically from the olfactory bulbs, but not from other cortical areas." T. G. ANDREWS (Psychol. Abstr.).

AM. J. PSYCHIAT.

VOL. C. MARCH, 1944.

The Oxygen Content of Cerebral Blood in Patients with Acute Symptomatic Psychoses and Acute Destructive Brain Lesions.

The cerebral arterio-venous oxygen differences were determined on three patients with mental symptoms which appeared in the course of pernicious anemia, cardiac decompensation and luetic encephalopathy. In the two patients with an extracerebral origin of the mental disturbances the oxygen content of the venous blood was subnormal, while in the patient with an intracerebral process the venous oxygen content was above the normal value.

These observations suggest that a determination of the oxygen content of the venous cerebral blood may indicate whether the mental symptoms are produced by inadequate oxygen supply or result from changes in the brain, provided that alterations in the rate of blood-flow do not obscure these indications. (Authors' abstr.)

Variations in the Glucose Tolerance Observations in Schizophrenics before and after Shock Treatment.

1. The majority of schizophrenic patients who improved clinically showed a significant change in their oral glucose tolerance, this change being towards the normal.

2. In the occasional case, clinical improvement did occur without any significant change in the glucose tolerance.

3. Those who did not improve or deteriorated clinically showed no change in their abnormal tolerance or it became more abnormal.

4. This change could not be attributed to the administration of insulin *per se*, nor entirely to the change in absorption of the glucose in the gastro-intestinal tract.

5. The pre-treatment glucose tolerance curves in this series of schizophrenics seem to show an abnormally prolonged period before the return to fasting levels. (Authors' abstr.)

The Effect of Pleasant and Unpleasant Ideas on the Respiratory Pattern (Spirogram) in Psychoneurotic Patients.

1. The spirogram tracings were analyzed for irregularities in pattern in a series of 64 psychoneurotic patients and 24 normal control subjects during periods of induced ideational stimuli. During the second, third and fourth periods the subjects were directed to think of pleasant, unpleasant, and again of pleasant ideas. During the first period no direction was given, and during the last period the patients were asked to relax.

2. The respiratory tracings were analyzed for sighing respirations, minor fluctuations, major fluctuations, and points off an arbitrary line for the upper and lower border of the tracings.

3. The most consistent changes were observed on comparing the unpleasant period with its preceding pleasant period. Significant changes were found in all of the items in 43 patients (Group I) with diagnoses of hysteria, anxiety neurosis and reactive depression. In the remaining 21 patients (Group II) whose diagnoses were hypochondriasis, compulsion neurosis and questionable schizophrenia, a significant change was found in only two items on comparing the tracings for the unpleasant period and its preceding pleasant period.

4. Induced unpleasant ideas were associated with an increase in sighing respirations in both groups of patients and in the control subjects. These changes were significant for patients of Group I and for the control subjects.

5. Induced unpleasant ideas were associated with significant increases in patients of Group I in upper minor fluctuations, upper major fluctuations, points off the upper line, and lower minor fluctuations.

6. No significant changes were found during the unpleasant period in any of the items for Group II patients and for the control subjects. (Author's abstr.)

The Electroshock Convulsion Syndrome.

The evidence that the electroshock convulsion syndrome is the result of integrated activity of a cortical area near the fissure of Rolando and is essentially a pyramidal tract syndrome can be summarized as follows:

1. Electrical shocks given near the fissure of Rolando are the most efficient in producing convulsions.

2. The tonic pattern looks like the result of generalized excitation of the motor cortex.

3. Pyramidal tract impairment modifies the convulsive pattern.

4. Extrapyramidal tract disease does not modify the convulsive pattern.

5. Autonomic excitation appears to be a secondary phenomenon.

6. No simple medullary syndrome occurs. The medulla seems to be responding differentially to stimulation from above.

7. The " trigger zone " of the electroshock convulsion syndrome responds to various strengths and durations of iterative stimuli, with summation to the threshold convulsive dose typical of a strength-duration curve.

8. Anticonvulsant drugs such as sodium amytal act primarily on the higher cortical levels of integration. They also increase the convulsive threshold. Therefore, the " trigger zone " is probably at a fairly high level of cortical integration.

It is further suggested that the " trigger zone " plays a central role in all convulsions, epilepsy arising when there is an overflow of excess excitation from some other area to the " trigger zone " of the convulsive syndrome. The complex character of the convulsive patterns in epilepsy may result from the modifying influence of the cerebral dysrhythmias. Loss of consciousness may be due to interference with the normal integrative balance of the cortex, rather than due to the " knocking out " of any centers. (Author's abstr.)

APRIL.

Centennial Anniversary Issue. A History of Psychiatry in the United States of America 1–199

MAY.

Brain Lesions Associated with Experimental " Epileptiform " Seizures in the Monkey.

By means of a single application to the cerebral motor cortex of certain chemical and immunologic agents, it has been possible to produce convulsive seizures in the rhesus monkey. Of more significance than the acute manifestations observed was the state of chronic convulsive reactivity induced.

A histopathologic examination of monkeys exhibiting recurrent convulsive seizures indicated a pathologic process which was essentially that of a chronic progressive meningo-cortical cicatrix. However, a similar type of lesion was produced by control preparations, which failed to induce convulsive seizures at any time during a long observation period.

From this study it must be concluded that the pathologic changes observed were insufficient to account by themselves for the convulsive manifestations. (Authors' abstr.)

The Electroencephalogram in Post-traumatic Epilepsy.

The electroencephalograms of 175 cases of post-traumatic epilepsy and of 215 cases of head injury without epilepsy were compared. The group of head injury patients without epilepsy was subdivided into 113 cases of mild injury and 102 cases of severe injury. In all cases the electroencephalogram was taken three months or more after the injury so that only the chronic post-traumatic state was considered.

Comparisons were made between the electroencephalograms of these three post-traumatic groups, a group of 1,161 unselected epileptics and a group of 1,000 normal control subjects.

On the basis of differences between the five groups, the following conclusions are drawn with regard to the electroencephalogram in the chronic post-traumatic state:

1. Among patients with severe head injuries but no seizures, the incidence of abnormal electroencephalograms continues to decrease from three months to two years after injury.

2. Among post-traumatic epileptics there is a relatively slight decrease in the incidence of abnormalities from three months to two years after injury.

3. Mild head injuries do not greatly increase the incidence of abnormal electroencephalograms above the level encountered in the normal control series.

4. In severe head injuries without seizures, the incidence of electroencephalographic abnormalities is more than twice as high as in the normal control group.

5. After head injury, children are slightly more likely to show abnormalities than adults. They are especially likely to show focal abnormalities.

6. Focal electroencephalographic abnormality is four times as common in post-traumatic epileptics as in unselected epileptics.

7. Focal electroencephalographic abnormality correlates with focal seizures. It strongly suggests localized brain damage.

8. Focal paroxysmal electroencephalograms, i.e., those manifesting focal seizure-discharges, are twenty-one times as common among post-traumatic epileptics as among head injury patients without seizures.

9. Subjective complaints after head injury do not correlate significantly with electroencephalographic abnormalities. (Authors' abstr.)

Rapid Changes in the O_2 Tension of Cerebral Cortex during Induced Convulsions.

A relative anoxia of the cerebral cortex occurs before, during and after convulsions induced

electrically or by a variety of drugs. This relative anoxia is believed to be caused by increased cerebral metabolism. (Authors' abstr.)

Clinical and EEG Studies in Obsessive-Compulsive States.

(1) A series of 31 patients presenting as a dominant feature in their clinical picture obsessive-compulsive phenomena were studied clinically and electroencephalographically. Twenty-four of these cases were classifiable as psychoneurotic, obsessive-compulsive type, two as epileptic and the remaining five as schizophrenia.

(2) Twenty of the total of 31 patients, or 64 per cent., exhibited patterns which were classifiable as abnormal. Of these 20 cases 14 showed serial 2–4 cps potentials of high amplitude either before or after a two minutes' period of hyperventilation. Approximately 29 per cent. of the obsessive-compulsive patients studied exhibited records which were classified as definitely normal.

(3) The greatest incidence of records exhibiting electrocortical dysfunction occurred in the age-group below 30 years of age.

(4) Approximately 35 per cent. of the entire group gave definite positive histories of psychopathy in the family. Of the cases showing electrocortical dysfunction 40 per cent. gave positive histories, while of the patients showing no EEG abnormalities 27 per cent. gave positive family histories. (Authors' abstr.)

AM. J. PSYCHOL.

ARCH. DI CRIM. NEUROPSIQUIAT. Y DISC. CON., QUITO.

ARCH. INT. MED.

ARCH. NEUROL. PSYCHIAT.

Electronarcosis in Animals and in Man.

1. In man, as in animals, a state of unconsciousness (electronarcosis) can be maintained by the passage of a current through the head. In man electronarcosis has been prolonged up to thirty minutes.

2. Two forms of electronarcosis have been observed in the dog—a narcotic form, which resembles chemical narcosis, and a hyperkinetic form, which is characterized by strong motor activity.

3. In man the symptoms of electronarcosis were a mixture of symptoms of the narcotic and the hyperkinetic type of electronarcosis.

4. All symptoms studied, occurring during and after electronarcosis, were found to be completely reversible. (Authors' abstr.)

APRIL.

Dystonia. II. Clinical Classification.

1. Dystonic movements and dystonic postures are symptoms of an organic nervous disease. Their occurrence alone does not enable one to make the diagnosis of a disease entity.

2. On the basis of all the available clinical data, the clinician is able to separate cases which are classifiable under well-known diseases, such as chronic epidemic encephalitis, Wilson's disease and Huntington's chorea. Neither these cases nor other cases in which appear gross lesions of known character, such as tumor, vascular lesions and birth injuries, should be included with the dystonias.

3. The diagnosis of "dystonia" should be made only in cases with the following clinical characteristics: (*a*) Selective systemic symptoms in the form of dystonic movements and postures, and (*b*) gradual development, without recognizable etiologic factors at the onset.

4. The dystonias may be further classified into the early form, with an onset at or shortly after birth; the juvenile form, with an onset between the age of 5 and 15 years, and the late form, with an onset after the age of 15. (Author's abstr.)

Delirium: (I) Electroencephalographic Data.

Psychologic and electroencephalographic studies of 53 patients with delirium of varying cause, intensity and duration revealed electroencephalographic abnormalities in all patients who had disturbances in consciousness. These changes were found to be reversible to the extent to which the clinical delirium was reversible. The character of the electroencephalographic change appeared to be independent of the specific underlying disease process, but was directly related to the intensity, duration and reversibility of the noxious factors, as modified by the basic physiologic status of the body. A correlation was established between the electrical abnormality and the primary psychologic symptom in delirium, i.e., the disturbance of consciousness, but there was far less correlation with the more personal aspects of behavior, namely, the character and expression of anxiety, the content of thought and the nature of sense deceptions. (Authors' abstr.)

Delirium: (II) Reversibility of the Electroencephalogram with Experimental Procedures.

One hundred per cent. oxygen was administered in a total of 20 experiments to 9 delirious patients with congestive heart failure and to 4 delirious patients with pulmonary decompensation. The electroencephalogram showed definite improvement in 10 experiments, probable improvement in 7 experiments, and no significant change in 3 experiments.

Three patients with congestive heart failure showed more abnormalities in the electroencephalogram when they were in the recumbent than when they were in the sitting position.

Four of 6 patients with Cheyne-Stokes respiration showed phasic variations in the electroencephalogram corresponding to the phases of respiration. The electroencephalogram improved

during the hyperpneic phase and showed more abnormalities during the apneic phase. For 2 patients with pronounced stage IV electroencephalograms no significant changes were demonstrable.

One patient with extreme anaemia of unknown cause had a more normal electroencephalogram after blood transfusion. The hemoglobin concentration rose from 2·5 to 5·8 gm. per 100 c.c.

Two patients with Addison's disease were studied during therapy with desoxycorticosterone acetate and adrenal cortex extract. Adequate treatment with the former resulted in improvement in the electroencephalogram, but not in complete restoration to normal. Large amounts of adrenal cortical extract, sufficient to produce a significant change in the dextrose tolerance curve, resulted in further improvement in the electroencephalogram, particularly during administration of dextrose.

In the treatment of delirium correction of reversible physiologic disturbances is important.

(Authors' abstr.)

Biochemical Aspects of Glutamic Acid Therapy for Epilepsy.

The administration of dl-glutamic acid hydrochloride in amounts which benefit patients suffering from attacks of *petit mal* does not result in a significant shift of the acid-base balance of the blood. Urinalysis showed the effect of a mildly acidifying agent; d(—)-glutamic acid was isolated from the urine of the patients.

Administration of l (+)-glutamic acid is as effective as that of dl-glutamic acid hydrochloride. These results suggest that the therapeutic effects may be ascribed to the l (+)-glutamic acid.

(Authors' abstr.)

Fatalities Associated with Electric Shock Treatment of Psychoses: Report of Two Cases, with Autopsy Observations in One of Them.

Of two patients whose deaths were associated with electric shock treatment, the first died one week after her 14th treatment in a hyperpyretic state associated with status epilepticus. The second patient died two days after his second treatment. Autopsy in the second case disclosed evidence of cerebrovascular syphilis and other changes which were possibly due to the treatment itself. However, the alterations were not sufficient to account for death. A review of some of the pertinent literature indicates that the cause of death after electric shock treatment is still obscure. Selection of patients for treatment should not be indiscriminate, especially in the face of an unpromising prognosis. Electric treatment has attendant serious dangers, and should not be given to patients with a history of vascular or cerebral disease.

(Author's abstr.)

MAY.

Philadelphia Psychiatric Society.

Boston Society of Psychiatry and Neurology.

Effect of Glutamic Acid and Other Amido Acids on Maze Learning in the White Rat.

1. Rats fed dl-pyrrolidine carboxylic acid and rats fed neutralized dl-pyrrolidine carboxylic acid made fewer errors, required fewer trials, and learned the linear maze pattern in less time than either the aminoacetic acid-fed rats or the control rats. The differences were statistically significant.

2. The rats fed dl-pyrrolidine carboxylic acid required approximately the same time and the

same number of trials and made about the same number of type A errors as did the rats fed neutralized dl-pyrrolidine carboxylic acid.

3. The rats fed l-glutamic acid learned the maze in fewer trials, with fewer errors and in a shorter time than did the control rats. The differences between the measures for the former and for the latter rats were all statistically significant.

From results 1 and 3 we conclude that l-pyrrolidine carboxylic acid and l-glutamic acid acted to enhance the learning of a simple maze.

This effect could not be related to inanition. The natural glutamic acid increases the rate of formation of acetylcholine *in vitro*. (Authors' abstr.)

Specific Treatment of Psychosis due to Estrogen Deficiency.

An analysis of the previously reported use of estrogens in treatment of psychoses indicates that the therapy is specific for patients properly selected in accordance with the clinical criteria given here.

In the absence of accurate evidence of disturbances in the climacteric immediately preceding the psychosis, the chances of recovery with estrogen therapy are not better than even, although the clinical picture may be that of involutional melancholia.

If such patients are given estrogen therapy, however, their chances of prompt improvement are much better than if they receive no special treatment.

The new cases described here illustrate the difficulty of the diagnosis and the importance of a corroborative menstrual history. Five women whose menstrual histories were vague or inadequate failed to improve under treatment with diethylstilboestrol. One woman who had an agitated depression soon after a surgically-induced menopause responded dramatically to administration of the substance.

It is suggested that the term " involutional melancholia " in the *Statistical Manual*, published by the National Association for Mental Hygiene, Inc., be replaced by that of " psychosis due to estrogen deficiency." (Author's abstr.)

Biochemical Studies on Patients with Schizophrenia. Dextrose, Oxygen and Carbon Dioxide Contents of Arterial and Venous Blood from the Cranial Cavity.

The relatively low sugar content of arterial (femoral) and venous (internal jugular) blood for certain schizophrenic patients suggests a lower intracranial carbohydrate metabolism in these particular patients than in normal subjects, as determined by Gibbs, Lennox, Nims and Gibbs. On the other hand, the higher differences in the sugar contents of arterial and venous blood for certain schizophrenic patients than for normal subjects suggest a more intense carbohydrate metabolism in the former than in the latter.

In certain schizophrenic patients the intracranial oxygen metabolism is lower than in normal subjects.

The lower average venous-arterial difference in carbon dioxide content for the authors' schizophrenic patients than for normal subjects lends support to the postulate of a lower carbohydrate metabolism in certain schizophrenic patients than in normal subjects.

Their conclusions are offered with reservations, for reasons pertaining both to the method of study and to their own material. (Authors' abstr.)

Cerebral Metabolism in Hypoxia.

Chemical changes in the brain were observed in morphinized dogs breathing mixtures low in oxygen for periods of 15 to 60 minutes.

Below a critical level of 11 to 13 per cent. of oxygen in the respired air, the cerebral lactic acid increased with a decreasing supply of oxygen to the brain. The oxygen saturation of the arterial blood at the critical level was 55 to 65 per cent., and that of the cerebral venous blood 28 to 43 per cent. The level of lactic acid in the brain was independent of that in the blood.

Decomposition of phosphocreatine occurred in the cerebrum below a critical level of 7 per cent. oxygen in the respired air. The oxygen saturation of the arterial blood at this point was 23 to 35 per cent., and that of the cerebral venous blood 15 to 22 per cent. The cerebral arteriovenous difference in oxygen began to decrease at approximately this level.

Prolongation of the period of hypoxia from 15 minutes to one hour did not modify the extent of the chemical changes noted.

No decomposition of cerebral adenosine triphosphate occurred with even the most severe degrees of hypoxia studied.

Resynthesis of phosphocreatine was complete within five minutes after readmission of room air in animals with the most severe degrees of hypoxia studied. The lactic acid decreased more slowly, approaching the normal level in ten minutes after a period of breathing 7·4 per cent. oxygen, and in 46 minutes after a period of breathing 4·2 per cent. oxygen.

The electrocorticogram showed an increase in amplitude on administration of 13 per cent. oxygen, i.e., at a degree of hypoxia too mild to produce an increase in cerebral lactic acid. With 11·6 per cent. oxygen a definite slowing of the waves and a decrease in amplitude became evident. This change, therefore, occurred at the critical level for the beginning of the rise in lactic acid. (Authors' abstr.)

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VOL. XXIX. 1942.

ARCH. PSYCHOL., N.Y.

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BRAIN.

VOL. LXVII. MARCH, 1944.

The Nature of Transient Outbursts in the Electroencephalogram of Epileptics.

In view of the conflicting opinions which exist upon the status of the EEG in the diagnosis of epilepsy, the relationship of paroxysmal outbursts in the EEG to the presence of overt fits has been studied. Emphasis has been placed upon the more evanescent disturbances seen in the EEG, the significance of which has not previously been fully demonstrated.

The methods employed were: (*a*) In a selected subject to study the forms of paroxysmal disturbance elicited by a highly specific stimulus which had been found to induce epileptic attacks. This might determine the relationship of the most transient disturbances to epilepsy.

(*b*) In 850 subjects, divided into groups of idiopathic epileptics, patients with head injuries, neurotics, and normals, to study the incidence of larval outbursts, other transient disturbances, and other less well defined abnormality in the EEG. This would determine the relationship of these transient disturbances to overt epilepsy.

(*c*) In a highly selected group of subjects with disorders usually associated with epilepsy, but in whom a fit had not occurred before the first EEG record, to observe the presence of paroxysmal outbursts in the EEG. This might indicate the relationship of these transient disturbances to a liability to epilepsy.

The results showed that: (*a*) Even minute and evanescent disturbances might represent epileptic activity.

(*b*) Fully developed larval disturbances were not found in normal non-epileptics, with the exception of the identical twin of an epileptic, but they occurred in 27 per cent. of epileptics. Other paroxysmal outbursts occurred in 0·5 per cent. of non-epileptics compared with 29 per cent. of epileptics. Thus paroxysmal disturbances of all kinds are over 100 times as common in epileptics as in others.

(*c*) Study of the specially selected cases suggests that in them the presence of paroxysmal outbursts in the EEG indicates an inborn or acquired tendency to epilepsy.

These results have been related to previous work and to that of other investigators. This has suggested that similar changes which have been described by others in the EEG of patients with different neurological disorders indicate that a secondary change, usually associated with epilepsy, has arisen in them. In these circumstances it seems that a liability to epilepsy should be suspected even in the absence of fits. When these changes occur in an epileptic or in a patient suspected of epilepsy, they should be considered to indicate epileptic activity, and when they occur in apparently normal subjects they may be similarly suspect. As intermittent disturbances have been described in patients with an active psychosis, none of whom were included in the present investigation, these observations are limited to non-psychotic patients. With this limitation, the results seem to show that an epileptic liability, either inborn or acquired, can be demonstrated by the EEG, although the presence of actual epileptic fits depends on many factors, the basis of which is not understood. The conception of "latent" and "active" epilepsy, which has for long had clinical support, is advanced on the evidence which has been obtained from correlating clinical and electroencephalographic data. It is held that the inclusion of all these subjects under the heading of "epileptics" is undesirable, and that the application

of established clinical terms in this growing field should be made cautiously. With further knowledge a new nomenclature will be essential. (Author's abstr.)

BRIT. J. EDUC. PSYCHOL.

VOL. XIV. 1944.

BRIT. J. MED. PSYCHOL.

VOL. XX. APRIL, 1944.

Manic-depressive Disorder and Melancholia.

Melancholia and mania are reactive and not constitutional, though once there has been an attack there is a liability for recurrence. First attacks of melancholia are nearly always due to severe prolonged mental stress; a few are due to physical diseases. Mania is the result of a mental mechanism called "crowding out." This last consists in the keeping of unpleasant thoughts out of consciousness by occupying the mind continuously and completely with other matters. Mania is also due to recent severe mental stress, but of shorter duration than in melancholia. A few cases of mania may be of organic origin. S. M. COLEMAN.

Rationale of Convulsion Therapy.

A psycho-analytical explanation of the results achieved by convulsion therapy. The study of neurosis has revealed the potent and far-reaching effects in the psyche of danger situations. The sequence of events is: Traumatic situation—anxiety—repression. The writer believes that the repeated artificial induction of an actual traumatic situation in psychotics would produce identical reactions. S. M. COLEMAN.

Trade Training Failures in the W.A.A.F.

The writer summarizes: 55 cases (77 including those noted in the addendum) of W.A.A.F. airwomen withdrawn from trade training were investigated psychiatrically and the results analysed. Failure in training was found to be due to: (1) Mental dullness, (2) neurosis, and (3) psychopathic personality. Factors in predisposition to failure have been described; in the neurotic and psychopathic group as compared with a normal group, predisposition has been shown in the proportion of 4 : 1. Factors in precipitation of failure and breakdown have been described. Suggestions for the improvement of pre-selection in the W.A.A.F. have been made. S. M. COLEMAN.

BRIT. J. PSYCHOL.

VOL. XXXIV. MAY, 1944.

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VOL. V. MARCH, 1944.

Delvinal Sodium (Vinobarbital) in the Treatment of Epileptic States.

(1) In early and mild cases observed in out-patient clinics such as those of the *petit mal* variety, it is more effective than phenobarbital in controlling the seizures. Delvinal sodium acts more rapidly and does not produce the degree of drowsiness which follows the continued administration of phenobarbital.

(2) Institutionalized patients who do not respond well to phenobarbital react better to delvinal sodium.

(3) Because of its effect on psychomotor activity it is a valuable adjunct to other anti-convulsant drugs such as dilantin in the treatment of *grand mal* or severe motor seizures.

(4) In institutionalized epileptics of the severe type, while the seizures are not greatly diminished, the most striking effect of delvinal sodium is on the mental status. A large percentage of patients were more alert, reacted better to hospital routine and did not manifest drowsiness. Except for the three patients mentioned, confusion and toxic effects were less evident after continued administration when delvinal sodium was employed.

(5) Because of its rapid action and relatively low toxicity, the oral administration of delvinal sodium is of definite value in the treatment of serial seizures and their mental sequelae.

(6) None of the barbiturate derivatives in themselves alleviate the total symptomatology in chronic epileptics except as an adjunct to other procedures. (Authors' abstr.)

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MAY.

JUNE.

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GENET. PSYCHOL. MONOGR.

VOL. XXVIII. 1943.

INDIAN. J. PSYCHOL.

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J. ABNORM. SOC. PSYCHOL.

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J. AM. SOC. PSYCHIC RES.

VOL. XXXVII. 1943.

J. ANAT.

VOL. LXXVIII. 1944.

J. APP. PSYCHOL.

VOL. XXVII. 1943.

What Are the Personality Traits of the Successful Teacher?

A personality inventory was administered to 301 teachers. The teachers were divided, on the basis of supervisors' ratings, into a group of the more successful and a group of the less successful teachers. Analysis of the responses to inventory items revealed that the more successful teachers reported themselves to be (1) more at ease in social contacts, (2) more willing to assume responsibility, (3) less subject to fears and worries, (4) more sensitive to the opinions of others, (5) slower in making decisions than the less successful teachers. The 43 items which differentiated the more from the less successful teachers were re-scored according to their degree and direction of differentiation. The total scores thus obtained were found to differentiate also "as would be expected from the manner in which the scores . . . were derived."

Of the 301 teachers, 62 were from a group that might be expected to be better teachers; these 62 obtained higher total scores on the average than did the other 239 teachers. Each teacher was asked to indicate the degree to which he liked teaching. A significant relationship was found between expressed liking for teaching and high scores on the 43 items.

G. R. THORNTON (Psychol. Abstr.).

A Practical Clinical Test for Organic Brain Damage.

The investigation sought to devise a practical method of detecting brain damage by testing intellectual deterioration. The test battery devised included one test, the 1937 Stanford-Binet Vocabulary Test, that is relatively insensitive to brain damage, 9 interpolated tests, and 6 tests sensitive to brain deterioration. The deterioration tests involve learning and retention of new associations in both visual and auditory spheres. The subjects used consisted principally of 25 institutional patients diagnosed as having cerebral damage (D group) and 25 control subjects, mostly institutional cases, without diagnosis of brain damage (C group), the two groups being matched for age and vocabulary scores. Scores on each deterioration test as well as total deterioration score discriminate significantly (the lowest C.R. being 6.8) between C and D groups. By means of a regression equation using age and vocabulary scores, a predicted score from predicted score, the result expressed in a modified T score, yielded a measure of deterioration. This measure separated C and D groups with an overlap of only 13.5 per cent. A short form of the battery (about 15 minutes) discriminated almost as well as the long form (about 30 minutes). The correlation between scores on short and long forms was ·99. The test battery has proved useful clinically.

G. R. THORNTON (Psychol. Abstr.).

Limitations in the Use of Intelligence Test Performance to Detect Mental Disturbance.

"The Wechsler-Bellevue scale was administered to 40 morons and 80 schizophrenics, aged 30–39, and scores were compared with those of 210 controls of the same age range. Comparisons were made in terms of deviation scores expressing the performance of a patient on the individual tests relative to his own general level of performance." On the basis of the results, three diagnostic signs are tentatively suggested: (1) Adult morons display relatively low performance on arithmetic reasoning. (2) Adult schizophrenics perform relatively poorly on picture arrangement tests, and also (3) make a relatively poor showing on comprehension tests. Doubt is cast upon four other signs frequently found in the literature: (1) Relatively high vocabulary scores do not distinguish schizophrenics from morons. (2) Relatively poor scores on block designs test do not distinguish schizophrenics from morons or controls. (3) Variability from test to test does not distinguish morons from schizophrenics, although both are more variable than controls. (4) Superiority of verbal over performance scores does not characterize schizophrenics as a group, nor is the opposite distinctive of feebleminded. Extreme caution in labelling patients on the basis of test results in indicated.

G. R. THORNTON (Psychol. Abstr.).

An Experimental Study of the Pl ("Plodding") Characteristics of Persistence.

Scores were obtained for two extreme groups of college students—one composed of 30 persons rated high, the other of 30 persons rated low on Pl (patient plodding)—on several tests intended to measure Pl, and on six parts of the Bernreuter inventory, the O.S.U. Psychological Test, and point-hour ratio. Two smaller extreme groups, each composed of 14 subjects, were selected from the original groups by matching subjects for sex and psychological test scores. Sigmas, means, coefficients of variation, and critical ratios are presented for scores obtained on the several measures for the original high, low, and total groups and for the smaller high and low groups. The results lead to the following conclusions: (1) These measures differentiate subjects with high and low degrees of Pl: Point-hour ratio, lines/time on Perceptual Ability Tests (I) and (II), per cent. of time spent on Perceptual Ability Test (II) after the story becomes nonsense, Verbal Recognition Time, and Study Time Test Score. (2) There is a positive relationship between an individual's ability to do a task and the time he is willing to spend on it. (3) There are no significant differences in Bernreuter scores between persons having high and low degrees of Pl.

G. R. THORNTON (Psychol. Abstr.).

J. COMP. NEUR.

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Non-production of Hypothalamic Obesity in the Rat by Lesions Rostral or Dorsal to the Ventromedial Hypothalamic Nuclei.

Bilateral electrolytic lesions of various sizes made with the Horsley-Clarke instrument have been placed in the ventral septal region, the olfactory tubercle, the diagonal band of Broca, the medial and lateral preoptic areas, and the anterior hypothalamic area of rats. In some animals only one of these regions was damaged; in others several in combination were destroyed; and in six the lesions were so large that the entire region between the anterior commissure and the rostral edge of the median eminence, between the base and the dorsal limits of the hypothalamus, or the anterior commissure, and between the internal capsule on each side, was eliminated. In two of this third group the paraventricular nuclei also were destroyed. In addition, bilateral lesions of the dorsomedial hypothalamus at the rostrocaudal level of the ventromedial hypothalamic nucleus were made. None of these series of animals became obese.

It is, therefore, assumed that cell groups of the basal forebrain rostral to the ventromedial hypothalamic nucleus make little if any contribution to regulation of fat metabolism. Whatever the mechanism, it is destruction of the cells in or near that nucleus, or of their descending fibers in the brain-stem, which causes the syndrome.

The hypothalamic lesions of a large number of monkeys which have been operated in this laboratory over a period of years have been re-examined and compared with the protocols of the corresponding animals. It is believed that indications were found that the hypothalamic lesions which cause obesity in the monkey may be about the same as the effective lesions in the rat. (Author's abstr.)

The Oculomotor Nucleus in the Human Fetus.

The cell arrangement of the oculomotor nucleus in the human fetus is described. The main cell groups present in the adult brain are clearly shown in late fetal development. The cells making up the oculomotor nucleus are small, medium-sized and large multipolar neurons.

Three groups of small cells constitute the Edinger-Westphal nucleus. The medium-sized cells form an unpaired group in the midline. The large multipolar neurons form the lateral nucleus, which is divided into dorsal and ventral parts. The majority of the neurons in the lateral nucleus send their axons into the oculomotor nerve of the same side. The axons of many neurons in the caudal half of the oculomotor nucleus cross the midline and pass through the nucleus of the opposite side before entering the rootlets of the oculomotor nerve. The processes of the median nucleus and the Edinger-Westphal nucleus are much more difficult to follow.

Some of the fibers of the oculomotor nerve are in relation to cells of the reticular formation. Cells of the mesencephalic V type are related to the oculomotor nerve. A few of these cells occur in the oculomotor nucleus and others are located along the peripheral course of the third nerve. Certain cells of the mesencephalic nucleus at the level of the oculomotor nucleus send processes toward the oculomotor nerve. These observations suggest the possible sources of proprioceptive fibers in the oculomotor nerve. (Author's abstr.)

The Course of the Striae Medullares in the Human Brain.

The striae medullares are distinct fiber bundles which lie in the floor of the fourth ventricle. When traced laterad from the rhomboid fossa three groups were observed: (1) In rostral sections a small number of fibers passes into the white matter of the cerebellum which forms the lateral wall of the fourth ventricle at that point; (2) more caudalward, a few fibers pass by way of thin bands of white matter into the peduncle of the flocculus; and (3) still farther caudad, the majority of the strial fibers enter the pontobulbar body.

Medially the striae medullares dip into the raphe, and after a complete or partial decussation pass ventrad in the raphe to the region of the arcuate nuclei; beyond this the authors were unable to trace them in their preparations due to intermingling with the ventral external arcuate

fibers. Whether the striae consist of fibers coursing medially or laterally the authors cannot say. They are not a part of the secondary auditory system. (Authors' abstr.)

Physiologic Consequences and Anatomic Degenerations Following Lesions of the Primate Brainstem: Plantar and Patellar Reflexes.

1. Abduction and/or extension of the hallux with or without extension and/or abduction of the toes may appear as a pathologic reflex in monkeys including *Ateles, Cercopithecus cephus* and *Macacus* (*rhesus, nemistrinus* and *irus*) as well as in the baboon.

2. No evidence could be found to indicate that abnormal plantar or patellar reflex responses are dependent upon damage of the cortico-spinal system.

3. They may, however, be produced without any evidence of paralysis, by damage to the lentiform nucleus (which produces a contra-lateral effect), damage to the mesencephalic tegmentum (which usually produces a homolateral effect), or, in the pons or medulla, damage to the area occupied by the rubro-spinal system (which produces a homolateral effect).

4. There was no conclusive evidence that extensor plantar or abnormally overactive patellar reflexes can be evoked by reticulo-spinal or vestibulo-spinal system damage.

(Author's abstr.)

The Tegmento-Olivary and Central Tegmental Fasciculi.

1. The only long myelinated descending single-neuron systems traversing the mesencephalon and proceeding caudal to the pons and located outside the pes pedunculi and medial longitudinal fasciculi are the rubro-spinal and anulo-olivary (tegmento-olivary) systems.

2. The latter is composed of fine fibers and proceeds from the anulus aquaeductus to the inferior olive.

3. There is no myelinated thalamo-olivary tract.

4. The conception of a specific "central tegmental fasciculus" as an important, descending, extrapyramidal system is untenable. The composition of the fiber accumulations to which this name has been applied varies from level to level. Apart from the anulo-olivary (tegmento-olivary) system which at some levels is partly coincidental with the fibers called central tegmental fasciculus, none of the latter belong to any significant, long, descending, myelinated, single-neuron system.

5. There is no adequate present reason for considering the anulo-olivary (tegmento-olivary) an extrapyramidal motor system, and destruction of it fails to produce any characteristic physiologic defect clearly attributable to its dysfunction. (Author's abstr.)

The Structure and Fiber Connections of the Human Habenula.

1. The human habenula is composed of five cellular groups, each of which is in connection with a special fiber tract.

2. The fiber tracts associated with the human habenula are the same as in other animals but are quantitatively less developed.

3. In addition to a hippocampo-habenular tract (medial cortico-habenular tract), there are a few fibers from the nucleus of the lateral olfactory stria. These form a lateral cortico-habenular tract.

4. The olfacto-habenular tract arises from the eminentia parolfactoria (olfactory tubercle) and from a medial and a lateral parolfactory nucleus. These nuclei respectively correspond with the medial part of Meynert's basal ganglion and the nucleus of the diagonal band and with Ganser's nucleus of the basal longitudinal bundle.

5. The septo-habenular tract originates from the medial parolfactory nucleus in the septum.

6. There are two connections with the striatum—the amygdalo-habenular tract *via* the stria terminalis, and the pallido-habenular tract.

7. The thalamus is connected with the habenula by means of thalamo-habenular (principally originating in the pulvinar) and hypothalamo-habenular fibers. There are also connections with the tectum and with the pretectum. The position of all these tracts within the stria is as follows: centrally one encounters the olfactory, dorsolaterally the amygdalo-habenular, laterally the pallido-habenular, and ventromedially the thalamic tracts. The ending of these fibers within the habenula is at sites corresponding to their position in the stria.

8. The efferent fibers in the fasciculus retroflexus are arranged in three groups: pulvinar, habenular, and commissural fibers. (Author's abstr.)

The Nerve Supply to the Pituitary of the Rat.

An investigation of pituitary innervation in the albino rat has yielded the following results:

1. The nerve supply to the posterior and intermediate lobes arises from the infundibular tract in two discrete bundles. These bundles, which course along the superior and inferior border of the pars nervosa, have been termed the superior and the inferior hypophysial fasciculus respectively.

2. Compared with the rich innervation of the posterior lobe, the nerve supply of the intermediate lobe is relatively small, and is distributed throughout widely separated areas. The nerve-endings, which may be single or forked, show definite terminal enlargements.

3. The relatively smaller innervation of the anterior lobe is derived from (*a*) the infundibular

tract, by way of the capsular sheath; (*b*) the hypophysial fasciculi, by way of the pars intermedia; and (*c*) the small nerves accompanying the blood vessels to the anterior lobe.

4. The total number of nerve-fibers present in the pars anterior is approximately 12,000, of which the larger portion (75 per cent.) is contributed from the hypophysial fasciculi. Again, of this percentage the greater part arises from the inferior fasciculus and enters the central region of the lobe. About 20 per cent. of the total number of nerve-fibers accompany the hypophysial blood vessels, and the remainder proceed to the pars anterior from the infundibular tract.

5. The nerve-endings in the anterior lobe are in all cases single, and exhibit terminal enlargements. No evidence of pericellular nerve nets was observed in either the anterior or in the intermediate lobe. (Author's abstr.)

Degeneration in the Dog's Mammillary Body and Ammon's Horn Following Transection of the Fornix.

The fornix after entering the cephalic dorsolateral corner of the mammillary body passes caudad in the lateral border of the median mammillary nucleus to terminate when about halfway through the nucleus. Usually the fornix passes median to the lateral mammillary nucleus, but sometimes extends outward above it. The distribution of degenerated fornix fibers is apparently confined to the external portion of the median mammillary nucleus (about one-fourth of its cephalic half), although short bulgings out of degenerated fornix fibers into the lateral mammillary nucleus were noted.

The mammillo-thalamic tract leaves the median portion of the mammillary body at approximately the same level that the fornix enters it from in front. In contrast to the fornix, its terminal fibers in the mammillary body are either in the form of finger-like branches or capsular fibers. The former come from the median portion of the median mammillary nucleus (possibly three-fourths of its total area), and extend much further caudad than the fornix; while the latter come from the lateral mammillary nucleus and possibly from the caudal portion of the median mammillary nucleus. There is no evidence of the finger-like bundles encroaching into the territory of the degenerated fornix fibers.

Nissl sections through Ammon's horn disclose chromatolysis not only of all the pyramidal layer cells, but of isolated pyramidal cells in the polymorphic layer of the dentate gyrus, thus making the inferior alveus a significant component of the fornix.

The complete chromatolysis of all the pyramidal cells of Ammon's horn after transection of the fornix, the absence of more than the normal number of degenerated fibers in the fornix behind its transection, and a solid field of degenerated fibers in front of its transection, are indicative that the fornix is solely an efferent tract from the hippocampal region.

(Author's abstr.)

The Substantia Nigra and the Entopeduncular Nucleus in the Cat.

While studying the amygdala and its fiber connections, lesions were produced in kitten brains (Horsley-Clarke technique) medial to this complex. Results obtained, other than expected, appear interesting in the light of recent reports on the substantia nigra and the globus pallidus.

The cells of the substantia nigra, and of the so-called ventral tegmental area of Tsai with its included nucleus of the mammillary peduncle, disappeared in four brains with lesions in the cerebral peduncle and the ventromedial end of the internal capsule that destroyed the entopeduncular nucleus and damaged the globus pallidus. The nucleus subthalamicus, part of the mammillary body and the hypothalamus were injured in two of the above four brains, but none of these structures was involved in the remaining four brains. The combination of these results indicates that the axons of the substantia nigra are directed cephalad in the cerebral peduncle and agrees with the Marchi experiments of Ranson and Ranson ('41) and Kimmel ('42). Moreover, since the ventral tegmental area of Tsai, with the associated nucleus of the mammillary peduncle, degenerated equally well in these four brains, it seems likely that this nucleus does not contribute fibers to the mammillary peduncle, but rather that it is a part of the substantia nigra and sends its fibers forward in the cerebral peduncle.

The entopeduncular nucleus degenerated completely in one brain, although the globus pallidus remained intact following a lesion medial to the entopeduncular nucleus that extended into the fields of Forel and interrupted the pallidofugal fibers. This disappearance of the entopeduncular nucleus suggests the homology of this nucleus with the medial segment of the primate globus pallidus which Ranson and Ranson ('39) have shown degenerates after similarly placed lesions. (Authors' abstr.)

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Studies of Abnormal Behavior in the Rat. XVI. A Case of Generalized Inhibitory Neurosis.

1. Abnormal behavior characterized by extreme passivity which conforms to generally accepted criteria of abnormality has been observed in a rat. It was shown that this behavior was associated with the type of test situation to which the animal was subjected. For example, a conflict situation (one-window test) was found much more effective than a frustrating situation (no-solution problem).

2. Those situations most effective in producing the passive behavior were also most effective in producing a decrease in the level of spontaneous activity as measured by an activity wheel. The abnormality thus extended outside the experimental situation.

3. Because the abnormality was associated with the one-window test, this situation is regarded as highly stressful for the rat. (Authors' abstr.)

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Eight Cases of Section of Corpus Callosum in Individuals with a History of Epileptic Seizures: Psychological Tests.

The author presents pre-operative and post-operative test results for eight cases of section of corpus callosum. Tests used included Stanford Binet, Healy Pictorial Completion, Arthur Scale performance tests, Gates Visual Perception A1, 2, 3, and Rorschach Ink-blots. "Of the tests given only those of immediate memory show any decrease. No picture of the 'syndrome of the corpus callosum' is reflected in the test scores."

H. H. Nowlis (Psychol. Abstr.).

Patterns and Scatter of Mental Abilities in Various Psychoses.

Two hundred and sixty-nine institutionalized mental cases, including schizophrenics, paretics, manics, psychoneurotics, drug and alcoholic cases, and mentally defectives, were given the Wechsler-Bellevue intelligence test in an effort to check the effect of the various psychoses on mental ability. Results indicate that the psychotic groups did not show mental patterns essentially different from those of the control group (100 attendants) on different sub-tests of the Bellevue scale. The same data were further analyzed for scatter on different parts of the test. No greater scatter in mental abilities was found among any of the psychotic groups or the mentally deficient group than among the normal group. Present results are being supplemented by data obtained on the Bellevue vocabulary sub-test to check the Babcock theory that vocabulary does not deteriorate as do other mental functions.

H. H. Nowlis (Psychol. Abstr.).

A Rapid Test for "Deterioration" with Comparison of Three Techniques.

A test consisting of the serial subtraction of sevens from one hundred, previously standardized for mental age in school-children, was administered to 580 patients with a wide variety of psychiatric disorders. Correlation with the Babcock test ($r=.702$) and the Shipley-Hartford test ($r=.797$) suggests that serial-sevens is testing a factor more allied to the abstract thinking ability measured in the Shipley-Hartford than to the memory-learning and motor-ability items of the Babcock. Comparison of results on the three tests for progressively severe deterioration suggests that serial-sevens is a sensitive indicator of mental deterioration.

H. H. Nowlis (Psychol. Abstr.).

J. GENET. PSYCHOL.

J. NERV. MENT. DIS.

Physiology of the Spinal Cord.

An attempt was made in four patients to alleviate by chordotomy some of the disagreeable features of motor disturbance. The writer concludes: "Anterior chordotomy is practically of no benefit in the treatment of spasticity resulting from cerebral or cord lesions because the spasticity is basically governed by spinal reflexes. . . . Section of a posterior column has failed to alleviate in any way the disorders of dystonia musculorum (one case)."

S. M. Coleman.

Physiology of Schizophrenic Thinking.

The writer summarizes: "This paper attempts to indicate a physiological substratum for basic disturbances of schizophrenic thought. A detailed analysis of a few excerpts from a case history allows us to differentiate symptoms indicative of a disturbance both in the structure and in the dynamics of the processes of thinking."

S. M. Coleman.

Psychoneurotics and Contraception.

The writer concludes: "Many of the failures recorded by maternal health clinics are most probably due to the use of the contraceptive pessary by psychoneurotic patients. The use of the contraceptive pessary does not in any way alleviate the sexual or other symptoms of the psychoneurotic." S. M. COLEMAN.

NOVEMBER.

Dissolution of the Ego.

Dissolution of the personality is one of the most striking features of the schizophrenic process. Mannerisms and delusions of grandeur are reconstruction mechanisms. "The threat of the dissolution of the boundaries is met by the ego with attempts to fortify the boundaries by building up an exaggeratedly demarcated personality. Thus the schizophrenic mannerism is the manifestation of the attempted self-cure against the tendency of dissolution of the personality in the group concept." Again: "The schizophrenic models his delusions of grandeur and origin on kings, princes and aristocrats because in his childish conception these were persons who stood out in relief and were congenitally exceptional persons, sharply demarcated and apart from the masses." S. M. COLEMAN.

Prognosis in Schizophrenia.

The writers summarize: "In cases with especially favourable prognosis, shock therapy is beneficial, but when the prognosis is poor, shock therapy is of little value. Shock therapy is found to shorten the duration of illness in patients of good prognosis, and may be the deciding factor in patients of doubtful prognosis." Short duration of illness and absence of process symptoms are the two most significant factors for favourable outcome.

S. M. COLEMAN.

Oxygen in Electro-Shock Therapy.

The administration of oxygen in electric-shock treatment is found to reduce post-therapy symptoms, including headache, cyanosis, confusion, nausea and vomiting. Respiratory distress encountered without the use of oxygen is abolished. The mode of administration of the gas is easy and does not interfere with procedure of treatments. S. M. COLEMAN.

The Guillain-Barré Syndrome.

The literature is reviewed and a case is reported in a four-year-old child. There was complete flaccid paralysis of all extremities, generalized hyperaesthesia and prostration. In the C.S.F. the total protein reached 160 mgm. per cent., the cell-count remaining below 5. Except for some muscular atrophy the child made a good recovery. S. M. COLEMAN.

DECEMBER.

Spasmodic Torticollis.

From a study of 103 cases the authors conclude that the condition is usually of organic origin involving vestibular and extrapyramidal pathways. The psychogenic aetiology is relatively rare. There is evidence to suggest a relationship between spasmodic torticollis and encephalitis. Surgical treatment is often very satisfactory, the most effective operation being intradural rhizotomy. S. M. COLEMAN.

Electric Shock Therapy.

Of 90 schizophrenics treated, 31 are recovered and 11 improved; of 15 depressives, 11 recovered, 4 improved. Five chronic alcoholics were treated without favourable results. Dementia

or flattening were not observed in the recovered group. Subconvulsive shock, besides being painful and terrifying, was therapeutically ineffective. S. M. COLEMAN.

Mind in Asthma and Allergy.

It is concluded that there is a respiratory personality, whose vectors can be deduced. The asthmatic subject is of cyclothymic disposition associated with paranoid features, repressed hostility and self-punishment motives. S. M. COLEMAN.

Death during Sulfonamide Treatment.

The writer summarizes: "A case of lupus erythematosis treated with sulfonamides is reported, with autopsy finding of emboli of necrotic cells in the brain. The cells are most probably liver cells carried to the brain by the blood circulation." It is noted that there is danger in administering sulfonamides to patients with lupus erythematosis or this disease associated with arthritis and rheumatic fever. S. M. COLEMAN.

VOL. XCIX. JANUARY, 1944.

Bilateral Prefrontal Lobotomy.

Twenty patients were subjected to operation, of whom 50 per cent. showed some degree of improvement; 35 per cent. were unchanged. In so far as intelligence is concerned, there is essentially no measurable impairment following operation. The writer lists the following behaviour changes in the post-operative state: Somnolence, motor automatisms, lack of restraint, facetiousness and tactlessness. Some showed a pathological degree of euphoria, others disturbances of the time, space and body-schema. S. M. COLEMAN.

Constitutional Analysis.

Anamnesis of a woman of 34 suffering from recurrent mania is followed by a detailed constitutional analysis, under the sub-headings genotypical factors, temperament, sexuality and egodynamics. The study is an attempt to evaluate the quantitative and qualitative relationship of genotypical and paratypical factors to one another in their production of this patient's characteristics and present mental situation. S. M. COLEMAN.

Traumatic Psychosis.

Of 41 traumatic psychotics, 17 traced their mental disorder to a head injury allegedly received in the first World War. This study indicates that in the majority of cases there was sufficient evidence pointing to some basic mental disorder which was only incidentally associated with the trauma. It is concluded that the diagnosis traumatic psychosis as a disease entity is not warranted. The diagnostic label should indicate the primary condition and the presence of the traumatic factor. S. M. COLEMAN.

Subconvulsive Electric Shock Treatment.

Of 24 cases, of the affective psychoses, none showed improvement on subconvulsive treatment. S. M. COLEMAN.

Homosexuality: A Biological Anomaly.

Feminine male homosexuals differ from other males in that the usual decrease in serum cholinesterase following prostigmine does not occur. The masculine male homosexuals studied are probably facultative in their anomaly. S. M. COLEMAN.

FEBRUARY.

Anomalies of the Lumbo-sacral Spine.

Three unusual cases of lumbo-sacral spina bifida are presented: (1) Very extensive spina bifida occulta in a six-year-old girl with pronounced bladder difficulty as her chief complaint. The essential lesion was the adherence of a number of strands of the cauda equina to the dura at S2 vertebral level. (2) An adherent conus medullaris (to the dura at S2 vertebral level) in a very tall man, aged 22, with marked symptoms of cauda equina involvement. (3) A large congenital tumour of the cauda equina (cholesteatoma) in a thirteen-year-old girl in whom a simple meningocele, immediately caudal to the tumour, had been repaired ten years previously.

S. M. COLEMAN.

Psychopathic Behavior.

Analysis of psychopathic personality in 30 cases showed that the most common traits involved social delinquency, frequent change, rationalization, emotional immaturity, lack of judgment, lack of responsibility, drug addiction and callousness. Psychogenic motivation was demonstrated in only 9 cases. Neurotic personality traits and neurosis were frequent. The family history was considered as neuropathic in 23 cases. It is felt that a broken home is the most important single contributing factor to the development of psychopathic behaviour. It would seem from the evidence that environmental factors play a greater part in the development of psychopathy than do congenital factors.

S. M. COLEMAN.

Responses to Induced Anoxia in Schizophrenics.

Ten chronic schizophrenics were exposed to the inhalation of a gaseous mixture containing low percentages of oxygen. There were no permanent ill-effects and there was no change in the mental state.

S. M. COLEMAN.

Incidence of Bromism.

Bromide determination in 1,000 consecutive cases at the Warren State Hospital are reported. 12·3 per cent. showed bromides in serum levels of 25 to 400 mgm. per cent., whereas 2·6 per cent. were in the toxic range over 150 mgm. per cent. Bromide psychoses were present in about one-third of the cases in the toxic range, a total incidence of 0·8 per cent.

S. M. COLEMAN.

MARCH.

Anterior Cerebral Artery in Macaque.

Ligation of the anterior cerebral artery gives rise to widespread clinical and pathological changes. Occlusion at genu results in retardation, underactivity, prehensile difficulty, weakness of legs and positive Babinski. With occlusion at confluence the signs are as above, but are more marked. In addition postural changes are evoked. Occlusion at the origin results in coma, followed by stupor and finally underactivity. The gross and microscopic pathological changes are also described.

S. M. COLEMAN.

Blood Diastase and Glucose in Depression.

Quantitative determinations of blood glucose and diastase have been related to certain of the manifestations of depression. Increases of blood glucose are related to increases in "voice loudness," "speech rate," and increasing sadness as judged from facial expression. Blood diastase activity is related to a decrease in "voice loudness" and an increase in apathy.

S. M. COLEMAN.

Vertebral Fractures in Metrazol Therapy.

In a series of 800 cases a fracture incidence of 26·1 per cent. was found. They are about twice as frequent in males as in females and are greatest in those under 21. All fractures occurred

in the dorsal spine, and only vertebral bodies were involved. Kyphosis, scoliosis, arthritis, nuclear change and old fractures are no contraindication to metrazol therapy. Osteoporosis is a definite contraindication to the use of metrazol alone. In a series of 275 cases treated with curare, the incidence of fractures showed a marked drop (5·8 per cent.).

S. M. COLEMAN.

APRIL.

Prefrontal Association Areas in Man.

It appears that the principal neural tracts affected by bilateral prefrontal lobotomy are those making up the corticothalamic system, particularly the anterior thalamic peduncle. Histopathological investigation has indicated that there is a certain amount of cellular degeneration back to the medial thalamic nuclei, with occasional partial lobar atrophy of the prefrontal poles. There is reason to believe that an important consideration in the behavioural modifications accompanying lobotomy is the disruption of the neural chain consisting of the prefrontal association areas, the thalamus and the cerebello-pontine centres. The alterations in behaviour may be considered to be a reflection of underlying changes in motoric identification which constitute the substructure of both postural set and social attitudes. S. M. COLEMAN.

Biochemical Component of the Manic-depressive.

Seven adrenalectomized cats were studied as control. These received intraperitoneal injections of Ringer's solution and of the citrated whole blood of healthy subjects. The average duration of life of these controls was four days. Eleven adrenalectomized cats receiving citrated whole blood of manic patients lived on an average eleven days. These experiments provide biological evidence that the blood of manic patients may differ from the blood of healthy subjects.

S. M. COLEMAN.

Picrotoxin in Barbiturate Poisoning.

Two cases of barbiturate poisoning treated with picrotoxin are presented. It was found that respiratory failure necessitating artificial respiration did not occur after the administration of this drug was begun. S. M. COLEMAN.

Psychiatric Reactions to the War.

Forty-one patients showing psychiatric reactions attributable to the war or war effort are reviewed. The observed symptom-complexes were not distinguishable from those observed in peace-time admissions. The prevalence of a predisposing heredity was noteworthy.

S. M. COLEMAN.

Electric Shock in Involutional Psychoses.

From experience with 30 patients it is concluded that electroshock is the most useful form of therapy in the severe types of involutional melancholia. It should be combined with psychotherapy and administration of sex hormones. Those cases of long duration, those with severe schizoid or paranoid trends and those with arteriosclerotic features did not respond favourably.

S. M. COLEMAN.

J. NEUROPATH. EX. NEUROL.

VOL. III. 1944.

Experimental Studies on Electro-shock Treatment: The Intracerebral Vascular Reaction as an Indicator of the Path of the Current and the Threshold of Early Changes within the Brain Tissue.

1. Electric shocks varying from 60 to 2,000 milliamperes flowing for times varying from two-fifths of 1 second to 10 seconds were administered to cats, through electrodes measuring 100 mm.², applied to the temples. The site of the electrodes upon the skull corresponded to the anterior suprasylvian gyrus and small adjacent parts of the remainder of the fronto-cruciate lobe of the left and the right hemisphere.

2. With single shock doses of 500 to 1,800 milliamperes arteriolar vasoconstriction with blanching of the capillary bed, still noticeable at times varying from 5 minutes to 1½ hours after the shock, could be produced within the path of the current through the brain, where the maximum current density was 5 to 18 milliamperes per square millimeter of the diameter of the path. A shock dose of 300 milliamperes produced only a brief period of arteriolar vasoconstriction and blanching, noticeable within the path of the current 4 minutes, but not one-half hour after the shock. No vascular and perivascular changes following shocks with similar currents (350–450 milliamperes) were seen 1, 3 and 7 days after the shock.

3. With shock doses of 2,000 milliamperes, flowing for 5 seconds and more, vasoparalytic stasis could be produced within the core of the path of the current through the brain, where the maximum current density was at least 20 milliamperes per square millimeter of the diameter of the path. Marginal parts of the path of the current, where current density was less, showed arteriolar vaso-constriction and blanching of the capillary bed.

4. Early pathological changes of the neural parenchyma could be produced only with currents of 1,800 milliamperes and above, and only within the path of the current. With currents of 1,800 milliamperes, flowing for 2 to 5 seconds, where current density was 18 milliamperes per square millimetre of the diameter of the path, they were of an essentially reversible type. With currents of 2,000 milliamperes flowing for 5 to 10 seconds, where current density was 20 milliamperes per square millimetre of the diameter of the path within the core of the path of the current, they were of an essentially irreversible type. All these pathogenic currents were in amperage, time of flow and density far above the range of currents used in electro-shock treatment in man, in which currents of 300–900 milliamperes flowing for periods varying from $\frac{1}{10}$ to $\frac{3}{10}$ of a second through electrodes measuring 2,000–3,000 mm.² are usually employed.

5. With single shock doses within the range of amperage used in electro-shock treatment in man, no pathological changes of the neural parenchyma could be produced which were recognizable with present-day histological methods at times varying from 4 minutes to 7 days after the shock. It is concluded that early organic physiological and physico-chemical changes of the neural parenchyma must nevertheless exist, but that they are of an order not yet demonstrable morphologically. The nature of these early physiological and physico-chemical changes awaits future investigation. The question of late changes is likewise uninvestigated and open to future study. (Authors' abstr.)

J. NEUROPHYSIOL.

VOL. VII. MARCH, 1944.

Interaction of Neighbouring Fibers in Myelinated Nerve.

A systematic analysis has been carried out of the changes occurring in the excitability of nerve-fibers, induced by impulses travelling in neighboring nerve-fibers. The experimental results have been expressed in the form of interaction curves.

Flow of the action currents of the active fibres through the membrane of the inactive ones is the mechanism underlying the interaction.

Two parts may be differentiated in the interaction curve, because besides an immediate interaction, there is a residual interaction which outlasts the flow of the action currents. The residual change in excitability has an electric sign that consists of a change in the membrane potential.

The shape of the interaction curve depends upon the geometrical conditions determining the flow of the action currents through the inactive fibres and upon the temporal course of the testing stimulus. (Authors' abstr.)

The Electrical Activity of Regenerating Nerves in the Cat.

1. Action potentials and microscopic preparations of regenerating tibial, peroneal and saphenous nerves of cats were studied at intervals up to 466 days following primary suture.

2. Action potentials were detected as early as 17 post-operative days and were small and slowly conducted at velocities less than 1 mps. At longer post-operative intervals the potentials

increased in size, velocity, and complexity, showing at least two prominent components plus a C wave.

3. The thresholds for electrical stimulation of regenerating fibers were high peripherally and low centrally to the suture. At longer post-operative intervals the thresholds of the distal fibers became progressively lower.

4. The maximum conduction velocities were measured for regenerating fibers on both sides of the suture, and abrupt changes in velocity were noted as the impulse passed the suture. Also the most rapidly conducting fibers of the distal stump were not necessarily projections from the most rapidly conducting fibers of the central stump.

5. The progress of the return of conduction velocity in the fibers distal to the suture was slow and the velocities increased at a constantly decreasing rate with respect to time. The return of maximum fiber diameter followed a similar course.

6. The relationship between the maximum conduction velocity and the maximum fiber diameter in the regenerating nerve was approximately linear. (Authors' abstr.)

Effect of Temperature on the Oxygen Consumption of Brain Tissue.

1. Mean values of the oxygen consumption of cerebral cortex slices from adult albino rats were determined at graded temperatures within the limits 0·2° to 47·5° C. Most observations were made within the range 0·2° to 40° C. Three hundred and forty-five animals were used. Oxygen consumption was expressed in cubic millimeters (microliters), N.P.T., per milligram dry weight per hour (Qo_2). The standard deviation of the distribution and the standard error of the mean were calculated for the values of oxygen consumption at each temperature used in the range 0·2° to 37·5° C.

2. It was shown that the graph of log oxygen consumption as a function of temperature in degrees Centigrade was approximately linear over the range 10° to 37·5° C. The equation for this curve was—

$$\text{Log } Qo_2 = -0{\cdot}2438 + 0{\cdot}328t,$$

where "t" represents the temperature in degrees Centigrade. The Van't Hoff temperature coefficient, Q_{10}, in this temperature range was 2·13.

3. In the range 0·2° to 37·5° C. Qo_2 was constant for more than three hours. However, at 40° and above, Qo_2 diminished with time. This effect was the more marked the higher the temperature. However, when Qo_2 were calculated from the 20-minute period immediately following thermo-equilibration there was no evidence of discontinuity in the Qo_2-temperature curve.

4. Decrease in Qo_2 with time at 40° C. was found to be reversible for periods of exposure to 40° of as long as 3 hours. However, at 40·8° an exposure of more than 30 minutes resulted in some loss of capacity for oxygen consumption on restoration to 37·5°. This loss became progressively greater with increase in temperature, exposure time or both. However, there was a limit to the decline in Qo_2, at least for temperatures up to 47·5° and exposure times up to 2 hours. The "steady state" value of Qo_2 under these conditions amounted to about 10 per cent. of the Qo_2 at 37·5° and was termed the "thermostable" Qo_2.

5. There was no indication of the accumulation of a substance capable of inhibiting the oxygen uptake of fresh brain tissue when brain slices or brei were incubated for 70 minutes at 47·5° C.

6. The possible significance of these data in relation to the effect of hyperthermia on the intact animal was discussed. (Author's abstr.)

Experimental Analysis of the Function of the Basal Ganglia in Monkeys and Chimpanzees.

1. Lesions of one or more of the nuclear complexes of the basal ganglia of monkeys or chimpanzees produce disorders of movement which are similar to the choreo-athetosis and tremor seen in man following lesions of the same regions.

2. Irregular, involuntary, jerking choreiform movements appeared only to any degree in chimpanzees but occurred in slight form in the monkeys also. They were always contralateral to the ablation, affected arm and head more than leg, and were transient.

3. Tremor followed the same lesion in chimpanzees and in similar lesions in monkeys. It was an action tremor, absent during complete rest, but present during the maintenance of posture or during movement. It was always marked at the beginning of voluntary movement and was accentuated by emotional stress and fatigue, and was bilateral, appearing whenever a sufficient amount of tissue within the circuit had been damaged.

4. The mechanisms involved in choreo-athetosis and tremor predicate two systems not greatly influencing each other, which exist within the basal ganglia. They cannot be geographically distinguished.

5. Anatomical and physiological evidence indicates that the cortical areas 6, 8 and 45 are connected with the basal ganglia, and that these nuclei are also directly influenced by thalamus and hypothalamus.

6. The relation of spasticity or rigidity to the basal ganglia has not been made clear by this investigation. But although isolated lesions of basal ganglia do not change resistance to passive manipulation, corticosubcortical lesions seem to increase resistance over that encountered following pure cortical ablations. Some differences in posture also appear when basal ganglia are removed in addition to decortication, as compared to the posture of a pure decorticate preparation.

7. There is a marked difference between the effects of lesions in monkeys and chimpanzees, and this is probably true for man also. The difference can be associated with anatomical changes in the putamen and extrapyramidal cerebral cortex. It is concomitant with the development of skilled use of the hands. (Author's abstr.)

MAY.

The Hind Brain and the Early Development of Behavior in Frogs.

1. The reflex response of embryos of *Rana limnocharis* to tactile stimulation varies in nature and duration as development advances. For embryos 2·0 mm. body-length the duration of the response averages more than 4 seconds. In embryos 3·0–4·5 mm. the duration decreases gradually and in larger individuals remains *ca.* 1·5 seconds on the average.

2. Transection of the cervical cord does not alter the nature of the tactile reflex with development, nor its duration in embryos 3 mm. long. In larvae longer than 4 mm. the duration of the reflex is lengthened by transection of the cord. The increase in duration persists up until metamorphosis.

3. Transection of the dorsal cord does not increase the duration of the tactile reflex in 5 mm. tadpoles.

4. Decerebration does not alter either the nature or duration of the tactile reflex in tadpoles at any stage. Destruction of the rostral half of the hind brain has the same effect as transection of the cervical cord.

5. In the early stage of its action cyanide poisoning lengthens slightly the duration of the tactile reflex in normal and decerebrate larvae but does not alter it in spinal and bulbospinal preparations.

6. Spinal tadpoles exhibit more spontaneous activity than normal and decerebrate ones. Cyanide poisoning in the early stage of its action increases the spontaneous activity of normal and decerebrate tadpoles, but does not alter it significantly in spinal larvae.

7. These data indicate that a mechanism is laid down in the spinal cord of *Rana limnocharis* in its development, from the non-motile stage to one of translatory movements, for repeated reactions to a brief tactile stimulus, and that this mechanism is inhibited by impulses from the rostral half of the hind brain at and after hatching. (Authors' abstr.)

Reflex Inhibition of Intestinal Motility Mediated through Decentralized Prevertebral Ganglia.

In the cat the terminal branches of some axons remain intact in the inferior mesenteric ganglia following degeneration of all preganglionic fibers of spinal origin which reach these ganglia. Some nerve-fibers also remain intact in the distal segments of mesenteric nerves to the colon and the small intestine, following their interruption, after degeneration of all the fibers which grow distalward. These are regarded as the axons of ganglion cells located in the wall of the enteric canal which extend into the prevertebral ganglia.

Distension of the distal segment of the transected colon or direct faradic stimulation of its nerves has resulted in inhibition of motility in the proximal segment both before and after degeneration of the interrupted nerve-fibers following decentralization of the inferior mesenteric ganglia. Distension of the ileum or direct faradic stimulation of mesenteric nerves, likewise, has resulted in inhibition of motility in a more proximal segment of the small intestine following decentralization of the celiac ganglia by removal of the spinal cord from the lower cervical region caudalward and section of the vagi.

Demonstration of the intestino-intestinal inhibitory reflex in the large intestine following degeneration of the visceral afferent fibers which reach the colon *via* the inferior mesenteric plexus and the preganglionic fibers of spinal origin to the inferior mesenteric ganglia supports the assumption that true reflex connections are effected in the prevertebral ganglia.
(Authors' abstr.)

Experimental Hypogeusia from Horsley-Clarke Lesions of the Thalamus in Macaca mulatta.

1. The preference method was employed for assaying taste acuity because it yields a quantitative and objective measure. The reliability of the method was established by repeated determinations of the threshold curve.

2. Bilateral electrolytic lesions of the posteroventral thalamic nuclei produced consistent elevations of the preference thresholds for quinine hydrochloride in five monkeys.

3. Microscopic examination of serial sections through the lesions revealed that the severity of the taste deficit paralleled the amount of damage to the nucleus ventralis posteromedialis (arcuate nucleus).

4. The findings support the hypothesis that taste fibers synapse in the thalamus in close association with those bearing somatosensory impulses from face, mouth and tongue. The significance of the results with respect to cortical localization of taste was discussed.
(Authors' abstr.)

The Structural Identity of the Pain Spot in Human Skin.

1. After the removal of skin to various depths by chemical or by surgical means, exploration of the exposed surfaces by electrical stimulation yields information concerning the nervous structures at different levels. During regeneration of skin and of its sense organs after their experimental removal, similar procedures permit further analysis of the character of the unit pain spot.

2. Epithelium regenerates from the base of each hair-follicle before sensory endings are restored, and a nerve twig containing pain fibers grows up toward the epithelium near each group of one to three follicles. This twig then distributes to an area containing one pain spot and one follicular group. Normal skin may contain many follicles which at a given time contain no hairs.

3. The extreme sensitivity of the central high point in a unit pain area may be correlated with its position directly over the pain twig, such that terminals of several fibers may be activated by a stimulus at one point.

4. The growing ends of pain fibers in the skin are more sensitive to mechanical stimulation, and less sensitive to electrical, than are their final sensory endings. This distinction, however, is qualified by the conditions under which these stimuli are necessarily applied, such as conductivity to current of different tissue components, depths of endings and protection by overlying tissue, etc.

5. Dendritic fibers invade newly regenerated epithelium at about the stage when nerve fibers are approaching it, and appear first in the regions lying over the nerve twigs. It is not clear whether this indicates a functional relationship, or is related only to the stage of development of epithelium from follicles.

6. It is to be noted that accounting for the uniqueness of individual pain spots on a structural basis does not constitute an explanation of sensory localization for pain.
(Author's abstr.)

Physiological Neuronography of Some Cortico-subcortical Connections in the Chimpanzee.

The method of physiological neuronography has demonstrated the following in the chimpanzee:

(1) A cortico-caudatal system from band I (area 8), band III (area 4s), band VII (area 2) and area 24.

(2) A cortico-putamenal system from band II (area 6), bands IV and V (area 4) and band VI (area 1).

(3) A cortico-pallidal system (*a*) to the external segment from band II (area 6) and (*b*) to the internal segment from the anterior margin of band IV (area 4?) and from the anterior margin of band VIII (area 5?).

(4) A cortico-pulvinar system from bands IX and X (areas 40 and 39 respectively).

(5) A cortico-thalamic connection from the arm-subdivision of the central sector to its corresponding portion of the lateral thalamic nucleus. The firing into this thalamic nucleus appeared more retricted than in the monkey. (Authors' abstr.)

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Muscular Activity and Choline Esterase.

High and low serum choline esterase activities are contrasted with respect to the prevailing condition of autonomic and neuro-muscular activity. High values occur in acute emotional states and thyrotoxicosis; low values in catatonic stupor and after administration of narcotics. The purpose of this study is to define more clearly the relationship between serum choline esterase and exercise, in which both autonomic and neuromuscular activity occur together. The subjects were normal persons and effort syndrome patients. The latter gave the same results as the normals. A variety of vigorous exercises for 5–10 minutes produced a significant rise in serum choline esterase, which subsided within 10 minutes and was inhibited by eserine. The increase probably comes from the red corpuscles, since they suffer a simultaneous fall in choline esterase equal in amount to the rise in the serum. The site of the transference is unknown, but it is not in the muscle exercised. Further data are necessary to determine the physiological significance of serum choline esterase, but neuromuscular activity is certainly one of the factors. M. E. Morse (Psychol. Abstr.).

J. PSYCHOL.

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Psychological Researches in Schizophrenic Language and Thought.

The most commonly accepted psychological approaches to the investigation of schizophrenia involve studies of cognitive dysfunctioning. Thought has been abstracted from its conative and affective determinants, has been approached through the assumed parallelism of thought and language, and has often been measured with general tests developed for use with normals. Inquiries have been made as to the schizophrenic's inability to generalize and the relationship between schizophrenic and primitive thought. The selection of cases in many studies "reveals the need for a reformulation of the basic disturbance in schizophrenia in terms of empirically established psychological, psychiatric and psychoanalytic facts and for the recasting and reorientation of psychological methodologies in terms of this reformulation."

R. B. Ammons (Psychol. Abstr.).

A Delineation of Schizophrenic Language and Thought in a Test of Imagination.

An attempt was made to elicit fantasies from 75 schizophrenic patients, using the ten neutral pictures of Murray's Thematic Apperception Test. Analysis of the recorded fantasies showed a lack of direct relation to the life events of the patient, an inability to maintain an orientation toward fulfilling the instructions, a stirring of " inner unrest " in the direction of some sort of activity, and an orientation of the patient's responses in the present. There appeared to be an almost total unawareness of the self in relation to the outer world of persons and objects and to inner experiences, with an almost complete interpenetration or fusion of subject and object in the various productions. It appears that almost any stimulus from the vague and " dread external infinitude can evoke anything . . . from the equally dread, internal, undifferentiated infinitude of items indiscriminately fused from all levels of experience." Schizophrenic experience is thus merely relived " livid " experiences. R. B. AMMONS (Psychol. Abstr.).

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Abstract and Categorical Behavior Following Therapeutic Brain Surgery.

It is apparent that all patients do not show impairment or deterioration of abstract thinking following prefrontal lobotomy.

In the author's series of cases, the two patients who did not show pre-operative impairment of these functions also failed to show impairment in the post-operative period. That the possibility of pre-operative impairment be recognized is of utmost importance. There is a question as to whether the impaired abstract behavior observed following lobotomy is indeed a function of the surgical insult to the intact brain, or whether it is a residual of the pre-operative psychotic structure. Their data are inconclusive on this point. What is needed is a series of cases in which there is a demonstrable lack of pre-operative impairment of abstract behavior with subsequent post-operative determinations. It is clear from their data that clinical improvement may occur in the absence of improvement in abstract behavior and, conversely, there may be decided improvement in abstract functions without noticeable improvement in the general behavior patterns of the patient. (Author's abstr.)

QUART. J. STUD. ALCOHOL.

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Central Representation of Pain.

Histological and clinical evidence leads to the conclusion that pain is integrated at three levels in the brain: the cerebral cortex, where pain may be accurately appreciated and localized; the thalamus, where pain may be integrated with other modalities; and the tectum mesencephali, which probably rarely functions in normal man, and where appreciation of painful stimuli is closely related to feeling-tone, rather than sensory pain. F. W. IRWIN (Psychol. Abstr.).

Subjective Disturbances of the Sense of Pain from Lesions of the Cerebral Cortex.

The author describes five cases in which pain was associated with cortical lesions involving the parietal area. F. W. IRWIN (Psychol. Abstr.).

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1. Anatomy, Physiology, Biochemistry, Psychiatry, etc.

Negative Conditioned Reflexes versus Absence of Response Elicited from External Inhibition. Allen, W. F. [*Proc. Soc. exptl. Biol., N.Y.*, **54**, 169–70 (1943).]

The possible confusion beteeen absence of response due to external inhibition and that due to negative conditioning is demonstrated by observations on dogs trained to flex the foreleg in response to certain stimuli and to withhold response in the presence of others. Absence of response occurred in normal dogs long before there were signs of correct differentiation. It also appeared in dogs with parts of the association cortex removed, when the negative conditioned response cannot be elicited. During this external inhibition respiration is inhibited and the animal becomes quiet. It is suggested that external inhibition is a simpler response than a negative conditioned response. H. Peak (Psychol. Abstr.).

Three Years of Neuropsychiatry in the Canadian Army (Overseas). Part II. Van Nostrand, F. H. [*Canad. med. Ass. J.*, **49**, 367–73 (1943).]

Out of the mass of literature published on the subject of neuropsychiatric problems in war, four salient facts have emerged: "1. Psychiatric disabilities account for approximately 30 per cent. of all casualties invalided out of the Army during war. 2. Of these, over 80 per cent. show definite evidence of constitutional predisposition to psychotic or neurotic breakdown, or have constitutional defects such as mental deficiency or psychopathic personality. 3. In chronic or recurrent cases, where the above constitutional factor is present, the results from treatment are poor. Less than 25 per cent. of cases are rehabilitated to the point where they become useful combatant soldiers. 4. Psychoneuroses (including exhaustion states), occurring in stable personnel as a result of severe battle stress, respond well to early and adequate treatment and should not, as a rule, be evacuated to base general or special hospitals."

J. E. Zerga (Psychol. Abstr.).

A Mathematical Theory of the Affective Psychoses. Lettvin, J. Y., and Pitts, W. [*Bull. math. Biophys.*, **5**, 139–48 (1943).]

The theory introduces two variables, ϕ and ψ. The first represents the intensity of emotion, the second measures the intensity of activity. A set of integrodifferential equations is assumed to govern the variation of ϕ and ψ with respect to time. Since for increasing values of ϕ the conduct of the organism varies from great impassivity through a normal level of feeling to extremes of a circular depression or catatonic excitement, whereas an increase of ψ results in a transition from stupor to manic excitement, the solutions of the equations represent quantitative specifications of different psychotic states. (Psychol. Abstr.).

Electrical Responses from the Primary Acoustic Centre of the Frog. Ek, J., and Euler, C. L. v. [*Nature, Lond.*, **152**, 132 (1943).]

Sound stimuli elicit electrical potential changes in the central auditory pathways of the cat;

and this study carries such work to the frog, using micro-electrodes which afford a more detailed account of some of the phenomena studied previously in the cat. With electrodes in the superficial cell layers of the acoustic area some spontaneous activity was recorded. Sound stimuli elicit " off " and " on " potentials of opposite polarity. Amplitude of the discharges remained constant when the stimulation was as short as two seconds. But for longer stimulation the potentials gradually became diminished in amplitude. During the off-effect a definite inhibition of the discharge was seen. The frequency of spike potentials corresponded closely with the frequency of the sound stimulus, but this effect is not microphonic, as is attested by the off-effect and to 20–40 msec. latency. The spike potentials do not behave like single auditory fiber discharges, since amplitude varies with intensity of stimulation. There was no correlation between the duration of stimulation and the amplitude of the off-effect, but rather the off-effect was correlated with intensity of stimulation. R. L. SOLOMON (Psychol. Abstr.).

A Study of Thalamocortical Relations in the Rabbit. Rose, J. E., and Woolsey, C. N. [*Johns Hopk. Hosp. Bull.*, **78**, 65–128 (1943).]

The purpose of this study was to determine which thalamic areas degenerate and which remain intact after removal of the whole cerebral cortex (neo-, paleo-, and archicortex). The results demonstrate that after ablation of the entire telencephalon by the suction method, the behavior of the thalamic nuclei follows a rather simple pattern consonant with ontogenetic and phylogenetic considerations. There are two types of thalamic projection systems: one from the dorsal nuclei to circumscribed cortical fields, and a second, the ventral, to the whole or to extensive portions of the cortex. The epithalamus appears to be entirely independent of the telencephalon. M. E. MORSE (Psychol. Abstr.).

Control of Movements by the Cerebral Cortex in Primates. Hines, M. [*Biol. Rev.*, **18**, 1–31 (1943).]

The frontal lobe of the monkey contains the neural mechanisms which control the maintenance of posture, initiate progression, and select the appropriate skeletal muscles to be innervated. The use of a skeletal muscle in mass organization for purposive behavior depends upon the extrapyramidal system, while for discrete organization the pyramidal system is active. " Coincident with the remarkable mosaic type of localization of sensibilities within the three posterior lobes, control of movement, the initiation of contraction, fixation of more proximal muscles, distribution of tone, sequence of contraction with innervation of prime movers and of co-operating muscles have migrated as a whole to the frontal lobe of the primate, *Macaca mulatta*. Compared with the cat, in which extrapyramidal activity is distributed generously in three of the four lobes of the cortex cerebri, the frontal lobe of the monkey, like that of man, 'serves in the motor aspect of the mind.' " These conclusions are derived from studies of electrical stimulation of the cortex, differentiating the various cytoarchitectural areas.
R. L. SOLOMON (Psychol. Abstr.).

Psychoneuroses in the Canadian Army Overseas. Hyland, H. H., and Richardson, J. C. [*Canad. med. Ass. J.*, **47**, 432–42 (1942).]

Of 1,171 cases of mental disease admitted to the No. 1 Neurological Hospital overseas during an 18-month period (September, 1940, to April, 1942) psychoneuroses (649 cases) constituted over half the total number. Of the remaining 522 cases, psychoses constituted 165, mental deficiency 100, psychopathic personality 220, and chronic alcoholism 37. There are four common precipitating factors of neurotic illness: " (*a*) Difficulties in adaptation to army life; (*b*) domestic worries; (*c*) fears related to enemy action; (*d*) trauma."
J. E. ZERGA (Psychol. Abstr.).

Neurosis and Intelligence. Eysenck, H. J. [*Lancet*, **245**, 362–3 (1943).]

" The records of 3,000 male and female neurotic Service patients (N.C.Os. and other ranks) on the progressive matrices test of intelligence have been analyzed. The neurotic group tested is, on the average, neither more nor less intelligent than comparable non-neurotic groups. Taken in conjunction with previous results, this finding supports the view that the lower intelligence of neurotics is caused by a weakness in the efficiency of mental functioning, rather than by their inability to abstract and reason. Conversion hysterics are on the average less intelligent than other neurotics, while dysmnesic hysterics are on the whole of average intelligence. Patients suffering from chronic anxiety are on the average more intelligent than other neurotics. The distribution of scores in the neurotic groups is distinctly abnormal (platykurtic); there are far fewer cases of average intelligence and more cases of above average intelligence than would be found in a comparable sample of the normal population."
C. K. TRUEBLOOD (Psychol. Abstr.).

Psychosurgery: Collective Review. Walker, A. E. [*Surg. Gynec. Obstet.*, **78**, *Suppl.* 1–11 (1944).]

This is a comprehensive consideration of prefrontal lobotomy. In France, Germany and England, where psychoanalysis and shock therapy were increasingly used, Moniz' operation was practically ignored, but in Italy it was enthusiastically received. Many physicians think that the patient pays a high price for relief from fear, worry, and anxiety. The operation can be

endorsed only if he will probably use his new freedom in socially acceptable ways. Hence the operation should be refused to those persons whose previous behavior has suggested psychopathic propensities. Walker believes that the operation has a place. On a symptomatic basis it may be indicated after adequate psychotherapy has failed. Psychosurgery alone, however, will not produce social recovery; post-operative rehabilitation is equally important. Its future can be determined only after many cases have been studied intensively for at least five years, during which investigations much will be learned of the functions of the frontal lobes.

M. E. Morse (Psychol. Abstr.).

The Relationship Between Anxiety States and Organic Disease. Dunbar, F. [*Clinics*, **1**, 879–908 (1942–43).]

Dunbar gives tables of comparative personality profiles derived from a total of 1,000 cases of coronary occlusion, cardiac arrythmias, anginal syndrome and fractures. The cases are classified according to the sphere of major conflict (authority), their differing behavioristic and somatic reactions to it, and the trauma precipitating breakdown. Each syndrome is correlated with a well-defined personality type, although there is no implication of cause and effect, and the results cannot be used as an infallible guide to diagnosis or prognosis. Nevertheless, any person whose psychosomatic profile corresponds in general to one of the types is probably susceptible to the associated illness, and likely to develop it when subjected to special strain in the sphere of his major difficulty. Anxiety is the first sign of autonomic influence on the cortex or ego, and situations creating it have a relationship to disease. The more conscious and overtly expressed it is, the less the structural damage. Two contrasting patterns, cardiac and accident, emerge from this study.

M. E. Morse (Psychol. Abstr.).

Anxiety and Fatigue. Braceland, F. J., and Rome, H. P. [*Conn. med. J.*, **7**, 827–41 (1943).]

The authors discuss the reciprocal relations of anxiety and fatigue in the psychosomatic life of the Navy personnel. Fatigue activates the latent anxiety of normal persons, while in psychoneurotics anxiety induces fatigue. The gradations of psychosomatic response to combat are: (1) Simple fatigue and fear states with somatic preponderance. (2) Combat fatigue, or reaction to conditions close to the limit of physical and emotional endurance. This gradation is the same as operational fatigue resulting from daily routine flights, patrols, watching and waiting on lonely islands—all situations in which there is no opportunity to discharge accumulated tension. Its criteria are extreme irritability, chronic startle reaction (vigil), pronounced visceral disturbances, and panic. After a certain point restoration is impossible, and permanent changes in personality result. (3) Psychoneurotic reaction, in which fatigue becomes an escape from the traumatic situation. (4) Psychotic reaction, with great prominence of the somatic element and a characteristic distintegration of all systems of functioning. The treatment of the different classes is outlined.

M. E. Morse (Psychol. Abstr.).

Altitude Sickness in Fliers. Vokhmianin, P. F. [*Amer. Rev. Soviet Med.*, (**1**), 140–4 (1943).]

The author describes the symptoms of airsickness. In the collaptoid type of subject the first symptoms are cardio-vascular. In the non-collaptoids, who have comparatively great cardiovascular stability, the first symptoms are cerebral. Cardiovascular instability is related to fatigue and fear, which in turn decrease resistance to hypoxia. Individuals presenting the cerebral reaction are more resistant to anoxia and better able to compensate generally. Autonomic lability is unfavorable to compensatory mechanisms in general. The nervous and psychological residues of altitude sickness usually pass unnoticed because the flier fails to complain after returning to ground level.

M. E. Morse (Psychol. Abstr.).

Report of a Case of Severe Anoxic Anoxia with Recovery. Ward, R. L., and Olson, O. C. [*J. Aviat. Med.*, **14**, 360–5 (1943).]

"A twenty-year-old white man was without supplementary oxygen, at high altitudes, for 55 minutes. He was unconscious for eight hours, and semicomatose for an additional eleven hours. Neurological examinations during the first 20 hours revealed diminished to absent deep and superficial reflexes, and a bilateral Babinski. There was also an increased spinal fluid pressure, and projectile vomiting. Patient had no subjective symptoms, such as headaches or dizziness, at any time. Psychological changes lasted about six days and subsequently cleared up, leaving no apparent intellectual defects nor personality changes" aside from an amnesia for three days preceding and six days following the accident.

A. Chapanis (Psychol. Abstr.).

The Effects of Pressure on the Carotid Sinus at Various Altitudes: Case Reports. Palitz, L., Frist, T., and Kocour, E. [*J. Aviat. Med.*, **14**, 346–55 (1943).]

Pressure on the carotid sinus produces reflex slowing of the heart-rate and, in hypersensitive individuals, dizziness and fainting. The authors describe two cases which suggest that a hypersensitive carotid sinus becomes more sensitive as the individual becomes anoxic at simulated high altitudes.

A. Chapanis (Psychol. Abstr.).

Sexual Libido in the Female. Greenblatt, R. B., Motara, F., and Torpin, R. [*Amer. J. Obstet. Gynec.*, **44**, 658–663 (1942).]

The authors found that progesterone (corpus luteum hormone) depressed excessive libido, while androgenic substances, as administered to 55 patients between 22 and 53 years, decidedly increased both libido and general well-being. The best results were obtained by implantation of pellets of testosterone propionate. Virilization never occurred, but almost every patient who, having once known libido, had lost it, experienced a resurgence. However, it could not be aroused in some psychologically frigid women who had never experienced it, and women who had had a marked to moderate degree before implantation experienced no change. The role of the hormonal component in women has not received due attention. The psychotic tendencies of nymphomania, premenstrual tension, the neuroses of frigidity and the problems of the incompatible couple are amenable to hormone therapy

M. E. Morse (Psychol. Abstr.).

Bisexuality and Male Homosexuality; Their Biologic and Medical Aspects. Myerson, A., and Neustadt, R. [*Clinics*, **1**, 932–57 (1942–3).]

The authors correlated the urinary excretion of androgens and estrogens with the physical and psychological characteristics of 102 males showing homosexual conduct. Their results show in general that the active homosexual has a high or normal androgen level and excessive estrogens, while the passive type has a low androgen level with only relative elevation of estrogens. The amount of androgens largely determines the vigor of the sex drive, and the absolute or proportionate amount of estrogens determines its direction. Homosexuality is not a biological entity, but a quantitative deviation. The biological aberrations come too late to affect the anatomy, although they are evident in behavior. It is not in itself a disease, but has the value of a psychopathic trait which makes the individual an abnormal personality, in addition to which he may be neurotic or psychotic. The authors obtained no lasting cures by hormone treatment, although the urinary formula could be changed.

M. E. Morse (Psychol. Abstr.).

Electroencephalography in the Selection of Naval Recruits. Solomon, P., Harris, H. I., Wittson, C. L., and Hunt, W. A. [*Nav. med. Bull., Wash.*, **41**, 1310–17 (1943).]

EEG records are being employed at the psychiatric unit of the U.S. Naval Training Station at Newport, R.I., as an aid in the proper selection of recruits. The report covers a total of 432 EEG subjects. The EEG recordings were found to be of positive selection value in 63 per cent. of the cases. The method was found to be of some screening value in denoting various neuropsychiatric conditions: Epilepsy, migraine, head injuries, organic feeble-mindedness, somnambulism and enuresis.

G. W. Knox (Psychol. Abstr.).

Significance of Transmineralization in the Pathogenesis and Therapy of Mental Diseases. Ratner, Ya. A. [*Nevropatol. i. Psikhiat., No.* **9**, 10–17 (1940).]

In psychoses and neuroses, transmineralization of the cerebral cells with resulting change of potential plays a major role both in the course of disease and in its cure. Insulin and cardiazole injections and hyperpyrexia bring about transmineralization, succeeded by a remineralization phase and return to normal. In hyperpyrexia produced by chemicals there is a remineralization phase; S-containing substances are especially effective.

C. S. Shapiro (Chem. Abstr.).

Vitamin B_1 Activity and Chronaxia. Chauchard, Mme. B., Chauchard, P., Busnel, R. G., Raffy, A., and Lecoq, R. [*Presse méd.*, **51**, No 8, 93 (1943).]

The determination of nervous excitability is most important for the estimation of vitamin B_1 activity.

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

Vitamin B_2 and the Nervous System. Chauchard, Mme. B., Chauchard, P., and Raffy, A. [*Presse méd.*, **51**, No. 5, 54 (1943).]

Observations on deficiency and excess of riboflavin in test animals indicated that vitamin B_2, as well as aneurine, must be considered as most important for the nervous system.

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

Synthesis of Ascorbic Acid by Brain Tissue in vitro. Pandra, José. [*Rev. soc. argentina biol.*, **19**, 137–50 (1943).]

Ox brain pulp shows a progressive decrease in ascorbic acid when incubated at 38° with egg yolk or egg white in phosphate buffer of pH 7·2. But if the brain pulp is first treated with O_2 for 15 minutes before incubation, the ascorbic acid first decreases, then increases to above the original value. This increase is even higher (40 per cent.) if the egg yolk is added after the second hour of incubation of the pulp alone. The increase appears to be due to enzymic synthesis of ascorbic acid.

L. E. Gilson (Chem. Abstr.).

The Nutritional Basis of Abnormal Behavior in Albino Rats. IV: Convulsive Seizures, Associated with Pyridoxine Deficiency. Patton, R. A., Karn, H. W., and Longenecker, Herbert E. [*J. biol. Chem.*, **152**, 181–91 (1944).]

A decreased sensitivity to sound-induced seizures is correlated with increased dietary levels of pyridoxine. Spontaneous seizures in suckling rats from pyridoxine-deficient mothers were alleviated by administration of 10γ of pyridoxine per day. Although 10 to 50γ of pyridoxine per day did not protect against sound-induced seizures, very high levels (150γ per day) delayed and lessened their severity. It is suggested that some other dietary factor or factors may be concerned. EDITH R. NEWTON (Chem. Abstr.).

Variations of Nervous Excitability in Avitaminosis C in Guinea-pigs. Chauchard, B., and Chauchard, P. [*Compt. rend. soc. biol.*, **137**, 135–6 (1943).]

As the animal is depleted of vitamin C chronaxia increases. The effect is central as in other vitamin deficiencies and the anesthetized avitaminotic guinea-pig exhibits normal chronaxia. The injection of vitamin C or desoxycorticosterone causes a transient return of normal chronaxia.
L. E. GILSON (Chem. Abstr.).

Vitamins and the Nervous System. Chauchard, Paul. [*Rev. sci.*, **79**, 620–41 (1941); *cf. C.A.*, **37**, 6712[8].]

A review. E. J. C. (Chem. Abstr.).

A Color Reaction of Ascorbic Acid with Nicotinamide and Nicotinic Acid. Milhorat, Thomas H. [*Proc. Soc. exptl. Biol. Med.*, **55**, 52 (1944).]

When dry ascorbic acid is mixed with nicotinamide or nicotinic acid and moistened, a bright yellow color soon develops. L. E. GILSON (Chem. Abstr.).

Metabolism of Nicotinic Acid. Moglia, J. L. [*Anales farm. bioquim. (Buenos Aires)*, **14**, 53–76 (1943).]

After the intraperitoneal injection of 25 mgm. of nicotinic acid (I) in rats there was a prolonged accumulation of (I) in the liver, with slow conversion to trigonelline (II), which was subsequently eliminated. The skeletal muscles fixed considerable (I) and showed little further variation during the experimental period of three hours. (II), probably formed in the liver, also increased in the muscles. The heart showed a large and rapid increase in both (I) and (II); this seems to indicate a more rapid conversion of (I) to (II) in heart muscle than in liver. The kidneys showed a marked and prolonged increase in (I) and (II). In dogs, 10 mgm./kgm. of (I) injected intraperitoneally passed into the blood in a few minutes and was quickly taken up and fixed by the tissues. A small amount was retained by the erythrocytes.
L. E. GILSON (Chem. Abstr.).

Disturbances of Neuromuscular Excitability during Dietary Imbalance and Avitaminoses. (I) Acute Carbohydrate Imbalance and Avitaminosis B in Pigeons. Lecoq, R., Chauchard, P., and Mazoue, Henriette. [*Bull. soc. chim. Biol.*, **25**, 73–9 (1943).]

In pigeons fed a diet containing 66% of galactose or a diet deficient in thiamine the results are similar. There is increased excitability of the brain and an increase in the chronaxia of the skeletal muscles. There is no important change in the chronaxia of the peripheral nerves although they show histological evidence of degeneration. L. E. GILSON (Chem. Abstr.).

Electroencephalography in Chickens in Avitaminosis B_1. de Finis, Mario L., and Odoriz, Jose B. [*Rev. soc. argentina biol.*, **19**, 314–20 (1943).]

Tracings are presented and discussed. The irregularities due to the avitaminosis disappear within a few hours after administration of a massive dose of thiamine.
L. E. GILSON (Chem. Abstr.).

Formation of Action Substances in Peripheral Nerves under the Influence of Artificial and Natural Stimuli. Scheinfinkel, N. [*Helv. Physiol. Pharmacol. Acta*, (1), 149–65 (1943) (*in German*).]

The liberation of acetylcholine by stimulated frog sciatic nerve was again demonstrated by the effect on the isolated frog heart. Vagus nerve from rabbit neck liberated acetylcholine and also an adrenaline-like substance. Thiamine unites with some enzyme system in the isolated frog heart and makes the heart refractory toward acetylcholine, even in the presence of eserine.
L. E. GILSON (Chem. Abstr.).

Behavior of Blood Sugar after Removal of Parts of the Hypothalamus. Bloch, W. [*Helv. Physiol. Pharmacol. Acta*, (1), 177–81 (1943) (*in German*).]

In cats, bilateral lesions of the middle hypothalamus between the columna fornicis descendens and the tractus mammillothalamicus disturb blood-sugar regulation. Fluctuations both above and below the normal range of 85–137 mgm. per cent. occur in an irregular manner.
L. E. GILSON (Chem. Abstr.).

The Hypothalamic Control of Acetylsalicylic Acid Antipyresis in the Monkey. Guerra, F., and Brobeck, J. R. [*J. Pharmacol.*, **80**, 209–16 (1944).]

In *Macaca mulatta* temperature control was unstable after experimental lesions in the anterior and anterolateral hypothalamus. The hypothalamic lesions did not alter the rate of decline of fever produced by yeast injection nor the rate of decline of temperature after administration of acetylsalicylic acid. The lesion usually increased the respiratory response to environmental warming and to fever. Sweating, normally occurring in monkeys with fever or placed in a hot chamber, practically disappeared after the lesions. Plasma specific gravity and chlorides increased after the operation, although blood dilution occurred in response to external heat and to fever. L. E. GILSON (Chem. Abstr.).

Regulation of the Fats, Lipoids and Ketone Bodies in the Blood by the Central Nervous System. Schrade, Werner. [*Z. ges. exptl. Med.*, **110**, 623–42 (1942); *Chem. Zentr.*, (**11**), 1811 (1942).]

Insufflation of air into the ventricles caused in the dog after 3–4 hours a considerable drop in the total blood fats. There was a constant drop in phospholipides and also of the cholesterol, the latter being almost exclusively in the ester fraction. The neutral fat also decreased. Similar treatment caused in the rabbit an increase in the ketone bodies which is considered a consequence of an increased fat metabolism. A. E. MEYER (Chem. Abstr.).

Nervous Regulation of Clotting Mechanism. Takáts, Géza De. [*Arch. Surg.*, **48**, 105–8 (1944).]

Autonomic stimuli as fear, nervous strain and hemorrhage increase the tendency to clotting. This may be due to a retention of heparin in the liver, or to increased formation of prothrombin, or hepatic production of an unknown substance which hastens coagulation.

JOHN T. MYERS (Chem. Abstr.).

A Comparison of the Action of Ca Gluconate and of $CaCl_2$ on Neuromuscular Excitability. Chauchard, Paul, Mazoue, Henriette and Lecoq, Raoul. [*Compt. rend.*, **216**, 744–6 (1943).]

Chronaximetric measurements establish that in the rabbit, the gluconate (I) and chloride (II) of calcium injected intravenously behave differently. (I) produces alkalosis after a hypercalcemic phase, (II) an acidosis. Analogous results occur with the rat and the guinea-pig. In man the chronaxie of nerve in tetany can be attributed to variations in alkali reserve and not in the blood Ca level. W. H. FISHMAN (Chem. Abstr.).

The Effect of CO_2 Tension on the Metabolism of the Cerebral Cortex and Medulla Oblongata. Craig, Francis N. [*J. gen. Physiol.*, **27**, 325–38 (1944); *cf. C.A.*, **37**, 4784[8].]

Raising the CO_2 from 1 per cent. to 5 per cent. under definite experimental conditions and pH 7·5 doubles the aerobic lactic acid output (Q_o) without altering the O uptake (Qo_2), while increasing the CO_2 from 5 to 20 per cent. has no further effect on the Q_o of the cerebral cortex and medulla oblongata. The Qo_2 only of the medulla is depressed under this condition. At pH 8·1 raising the CO_2 from 1 to 5 per cent. increases the Qo_2 and Q_o of the cortex by nearly 60 per cent. By reducing the O tension (from 95 to 3 volumes per cent.) the lactic acid output increases in the cortex by 114 mgm. per gm., and in the medulla by 8 mgm. per gm., while the CO_2 output in the cortex increases from 12·3 to 13·5 and in the medulla it decreases from 5·1 to 3·8. S. MORGULIS (Chem. Abstr.).

A Rapid Silver Stain for Nerve Fibers in Formol-fixed Paraffin Sections of the Human Spinal Cord and Medulla. McManus, J. F. A. [*J. path. Bact.*, **55**, 503–5 (1943).]

Dehydrate formalin-fixed tissue, embed and cut in paraffin; then pass through xylene and graded alcohols. Place the sections in chloral hydrate solution (chloral hydrate 1·0 gm., $AgNO_3$ 20·0 gm. and distilled water 100 c.c.) at 58° for 20–30 minutes. Rinse in water and place in the reducing solution (hydroquinone 1·0 gm., anhyd. Na_2SO_3 5·0 gm. and distilled water 100 c.c.). Wash and place in 1 per cent. aqueous $AuCl_3$ containing 4 drops of glacial HOAc per 100 c.c. for 10 minutes. Wash and place in 2 per cent. oxalic acid until the fibers can be clearly seen under the microscope. Place in 5 per cent. $Na_2S_2O_3$ for 5 minutes and wash. By varying the concentration of chloral hydrate and $AgNO_3$ it is possible to apply the method to other parts of the central and peripheral nervous systems. JOHN T. MYERS (Chem. Abstr.).

Inhibition of Brain Respiration by Picrotoxin. Klein, J. Raymond, and Hack, Marvin. [*J. biol. Chem.*, **151**, 651–7 (1943).]

The respiration of a cat brain and its ability to oxidize glutamate, succinate, fumarate and pyruvate *in vitro* was inhibited by picrotoxin. PHILIP L. HARRIS (Chem. Abstr.).

Decrease in Lactic Acid Content of the Brain in Poliomyelitis. Kabat, Herman, Erickson, Dorothy, Eklung, Carl, and Nickle, Margaret. [*Science*, **98**, 589–91 (1943).]

Lactic acid content of the brain is significantly decreased in mice infected with the virus of poliomyelitis. This appears to be evidence for the view that the virus may interfere in a specific manner with cell metabolism. E. D. WALTER (Chem. Abstr.).

Changes in Acid-soluble P Compounds in the Brain in Poliomyelitis. Kabat, Herman. [*Science*, **99**, 63 (1944).]

Normal albino mice and mice injected by intracerebral inoculation of poliomyelitis virus

were sacrificed by immersion in a mixture of solid CO_2 and EtOH. The brains of normal mice contained 8·13 mgm. of phosphocreatine (I), 16·9 of adenosine triphosphate (II), and 18·7 of residual organic phosphate. The brains of mice with poliomyelitis contained 3·44 of (I), 25.7 of (II) and 4·18 of (III). E. S. G. BARRON (Chem. Abstr.).

The Sugar in the Cerebroside of the Spleen in Gaucher's Disease. Klenk, E., and Rennkamp, F. [*Z. physiol. Chem.*, **272**, 280–2 (1942); *cf. C.A.*, **35**, 3314[6]; **37**, 2802[6].]

The sugar from the cerebrosides isolated from the liver and spleen of a 20-year-old man with Gaucher's disease (supplementary to a fatal case of meningitis) was identified as glucose. The cerebrosides were isolated by usual methods. The cerebroside from spleen had $(\alpha)_D^{20} = -10{\cdot}35°$ (pyridine, c = 4); cerebroside from liver had $(\alpha)_D^{20} = -9{\cdot}76°$ (pyridine, c = 4). For preparation of the free sugar in solution the cerebrosides were hydrolyzed for 30 minutes in 20 volumes 10 per cent. HCl at 100°, filtered, washed with 1 per cent. HCl, freed from excess HCl by $Pb(OAc)_2$ and AgOAc, from excess Pb++ and Ag+ by H_2S, and from HOAc by ether extraction in presence of CaO; the solution was concentrated *in vacuo* at 40–5° and made up to volume with H_2O. The sugar was identified as glucose. Both cerebroglucoside and cerebrogalactoside may be found in the spleen in Gaucher's disease, but the former appears to be more frequent.

IVAN A. WOLFF (Chem. Abstr.).

Ganglioside of the Brain of the Tay-Sachs Type of Infantile Idiocy. Klenk, Ernst, and Schumann, E. [*Ber.*, **75B**, 1632–6 (1942); *cf. C.A.*, **37**, 5743[7], 6285[8].]

Tay-Sachs' idiocy is a brain disease. A brain from a child about 3 years old (143·5 gm. dry weight) yielded 10 per cent. of fat and cholesterol, 14 per cent. of glyceryl phosphatides, a trace of sphingomyelin, 0·1 per cent. of cerebroside and 8 per cent. of ganglioside (I) fraction (containing 2·6 per cent. $C_5H_8(OH)_2$, 24·5 per cent. sugar (as galactose) and 10·77 per cent. neuraminic acid). The purification of (I) was carried out according to *C.A.*, **37**, 6285[8]; its formula was $C_{84}H_{118}O_{26}N_2$, m. 200–10° (decomposition); it was optically inactive in C_5H_5N. Hydrolysis of (I) with 10 per cent. HCl gave stearic acid and possibly nervoic acid ($C_{24}H_{46}O_3$), sphingosine, glucose and galactose (the last two in the ratio of 1 : 2). C. J. WEST (Chem. Abstr.).

Liberation of an Acetylcholine-like Substance in the Inner Ear during Stimulation by Sound. Martini, Virgilio. [*Arch. sci. biol. (Italy)*, **27**, 94–9 (1941); *Chem. Zentr.*, (**11**), 2583 (1941).]

After stimulation by sound the perilymph of the inner ear of the pigeon shows a 4-fold increase in a substance which acts on leech muscle as does acetylcholine.

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

Synthesis of Acetylcholine in Sympathetic Ganglia and Cholinergic Nerves. Feldberg, W. [*J. Physiol.*, **101**, 432–45 (1943).]

Sympathetic ganglia (superior cervical ganglion) and cholinergic nerves (cervical sympathetic, vagus, phrenic nerve and motor roots) divided with scissors into small pieces and incubated for 1–2 hours in buffered saline solution containing eserine synthesize acetylcholine (I). This property appears to be dependent on the intactness of some structural part of the tissue, since it becomes lost or greatly reduced when the mechanical destruction is carried too far, as by grinding the tissue with silica. No synthesis of (I) has been observed with sensory roots. Chopping sympathetic ganglia or cholinergic nerves with scissors for one or two minutes leads, without subsequent incubation, to some synthesis of (I). Synthesis occurs apparently only in order to replace released (I) and to restore its original concentration in the tissues. The procedure of chopping the tissue may release and bring into solution amounts of (I) corresponding to those originally present in the tissue, but about half of this amount is resynthesized in the particulate matter of the suspension during the one or two minutes of chopping. When the cervical sympathetic trunk is cut in a preliminary operation, the distal part of the nerve and the superior cervical ganglion lose their property of synthesizing (I) at an early stage of nerve degeneration (after about 48 hours). The loss of synthesis occurs with the great drop in the (I) content of the tissue and must be considered responsible for it. The loss precedes the loss of nervous conduction. In the ganglion it coincides with the time when synaptic transmission becomes impaired and lost. It is concluded that synthesis of (I) in sympathetic ganglia is a property of the preganglionic endings, and a necessary preliminary for normal and particularly sustained synaptic transmission. RUTH BERGGREN (Chem. Abstr.).

Mechanism of the Action of Acetylcholine: I. *Genuit, H., and Kubel, W.* [*Arch. exptl. Path. Pharmakol.*, **202**, 110–19 (1943).]

The Hypotensive Effects of Acetylcholine, Papaverine, Muscle Adenylic Acid and "Irenal" (4-dimethylaminophenylpiperidine-HCl) are Discussed: II. *Genuit, H., and Mussgnug, G.* [*Ibid.*, 120–31.]

In a few cats and dogs the hypotensive effect of acetylcholine was primarily the result of a modification of heart action, but in the majority the effect was primarily on the arterioles.

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

Acetylcholine and Acetylcholinesterase Contents of Organs of B_1-deficient and Normal Rats. Lissák, K., Kovács, T., and Nagy, E. K. [*Arch. ges. Physiol.* (*Pflügers*), **247**, 124–31 (1943).]

The acetylcholine content of B_1-deficient rats was increased in cholinergic effector organs (heart, striated and small intestinal muscles) and diminished in the central nervous system. The acetylcholine content of the sciatic nerve remains unchanged. The cholinesterase content of the serum was reduced in all cases, whereas the content of this enzyme in the various organs followed the changes in acetylcholine. In the sciatic nerve, however, the cholinesterase was lower in B_1-deficient than in normal animals. ARTHUR GROLLMAN (Chem. Abstr.).

The Acetylcholine-like Nature of Anaphylactic Shock and of Shock Produced by Agar. Danielopolu, Daniel. [*Compt. rend.*, **216**, 618–20 (1943).]

By injecting 0·1 gm. acetylcholine into a vein of a 2-kgm. rabbit one obtains symptoms characteristic of anaphylactic shock. Similar results occur with eserine, which acts through acetylcholine. A suspension of agar produces an anaphylactic-like shock, which is enhanced by eserine and inhibited by atropine. W. H. FISHMAN (Chem. Abstr.).

The Change in the Determination of the Cholinesterase Activity as Proposed by Longo, Colaciuri and Sorrentino. Pighini, Giacomo. [*Biochim. terap. sper.*, **28**, 51–4 (1941); *Chem. Zentr.*, **11**, 2040 (1942); *cf. C.A.*, **36**, 5876[8].]

The claim that aqueous solutions of acetylcholine or its HBr salt show spontaneous hydrolysis does not correspond to facts. The solutions are stable for several hours. Cholinesterase has its highest activity close to the neutral point. The proposed titration after 14 hours causes errors, since the developing acidity inhibits the cholinesterase. The method of Pighini (*C.A.*, **34**, 3292[9]) gives sufficiently accurate and comparable results for nerve tissues.

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

Relation Between Cholinesterase and Ascorbic Acid. Frommel, E., Herschberg, A. D., and Piquet, J. [*Helv. Physiol. Pharmacol. Acta*, (**1**), 229–39 (1943) (*in French*).]

In severe hypovitaminosis C in guinea-pigs the serum cholinesterase becomes inactive. Inactivation of serum cholinesterase in the normal animal does not affect the vitamin C content of the tissues. Addition of ascorbic acid does not increase the cholinesterase activity of normal guinea-pig serum *in vitro*, but does reactivate serum cholinesterase previously inactivated by poisons such as Au and As compounds. L. E. GILSON (Chem. Abstr.).

Action of Anticholinesterases on Motility of Extrinsically Denervated Intestine in situ. Youmans, W. B., Karstens, A. I., and Griswold, H. E., jun. [*J. Pharmacol.*, **80**, 205–8 (1944); *cf. C.A.*, **37**, 2814[2].]

In dogs, prostigmine (I) and physostigmine (II) exert their characteristic excitatory action on the motility of the intestine *in situ* in the absence of the extrinsic nerves. Atropine reduces or prevents this action of (I) and (II). The minimal doses of (I) and (II) required to stimulate the denervated intestine are sufficient to enhance the excitatory action of acetylcholine on motility. There is also a possibility that (I) and (II) have some excitatory action on intestinal motility exclusive of their anticholinesterase action. L. E. GILSON (Chem. Abstr.).

Cholinesterase. III. Specific Tests for True Cholinesterase and Pseudocholinesterase. Mendel, B., Mundell, Dorothy B., and Rudney, H. [*Biochem. J.*, **37**, 473–6 (1943); *cf. C.A.*, **37**, 5436[2].]

Acetyl-β-methylcholine (Merck's mecholyl) is hydrolyzed only by true cholinesterase, while benzoylcholine is hydrolyzed only by the pseudocholinesterase, and neither substrate is acted on by ordinary esterases. The methods for carrying out these cholinesterase determinations are described. S. MORGULIS (Chem. Abstr.).

Changes in Brain Volume and Blood Content after Experimental Concussion. White, James C., Brooks, John R., Goldthwait, Joel C., and Adams, Raymond D. [*Ann. Surg.*, **118**, 619–34 (1943).] RACHEL BROWN (Chem. Abstr.).

Ca and Mg in the Spinal Fluid in Progressive General Paralysis. Schere, Moises. [*Semana méd.* (*Buenos Aires*), (**11**), 733–5 (1943).]

In general paralysis the Ca in the spinal fluid varies between 4·1 and 6·8 mgm. per cent. The Mg is always increased to values between 4·8 and 8·2 mgm. The quotient Ca : Mg varies between 0·7 and 1·13. A. E. MEYER (Chem. Abstr.).

Mitogenetic Radiation of the Blood in Cases of Tumors of the Central Nervous System. Lotsman, L. A. [*Nevropatol. i Psikhiat.*, **9**, *No.* 3, 112–17 (1940).]

Ascorbic acid solutions irradiated by mitogenetic rays of the blood are partially decomposed, with a change in pH. This action is made the basis of a method of measuring mitogenetic rays. Acidity with HCl a solution of 0·005 mgm. of ascorbic acid in 25 c.c. H_2O; place half of this solution in each of two evaporating dishes; cover one with an ordinary watchglass and the other with a quartz watchglass. Expose the dish with the quartz watchglass to the rays from a drop of blood for periods of 30 seconds, and 1, 5 and 10 minutes. After each exposure pipet equal

quantities of the control and the exposed ascorbic acid into test-tubes containing equal amounts of an indicator and titrate with equal quantities of NaOH solution in the presence of a universal indicator. When there is no difference in color the effect is zero; when the irradiated tube has a lighter shade than the control, i.e., its acidity is increased by irradiation, the effect is called positive; when the sample is darker than the control, the effect is called negative. Curves were constructed from the values obtained on the indicator color scale for the four exposures for 10 normal and 72 pathological subjects, affected by different neurological conditions, of which 29 were cerebral and 11 spinal tumors. In normal subjects the effect of mitogenic radiation was usually positive from the beginning and gradually increased in intensity with the length of exposure. In acute and chronic encephalitis the effect was similar. Of the tumor patients, 31 showed a positive but abnormal mitogenetic effect; in 22 the initial radiation was very high, but within a minute dropped rapidly to zero and remained there for the rest of the exposure; in 9 subjects of this group the decrease was more gradual, reaching zero at the end of 10 minutes. A majority of another group of 9 patients showed a high negative initial effect, which was intensified during 10 minutes. A few patients of this group gave a normal initial value, decreased to a minumum and then gradually increased to the initial value. One patient gave a zero effect throughout the 10-minute exposure. In some there was a change from initial negative value to a high positive value toward the end of 10 minutes. In none of the tumors investigated was there any relation of the nature of the tumor, or its location (cerebral or spinal) to the shape of the curve. Six diffuse-sclerosis patients gave a typical curve; the effect was negative and of moderate intensity, beginning at 30 seconds and remaining unchanged during the 10 minutes. C. S. SHAPIRO (Chem. Abstr.).

The Functional Development of Some Mammalian Neuromuscular Mechanisms. Barron, D. H. [*Biol. Rev.*, **16**, 1–13 (1941).]

This is a comprehensive review of the literature concerning the appearance of various neuromuscular mechanisms during the ontogeny of many organisms. Some features are found to be common to all the animal forms so far studied. In early stages of development embryos are inactive, but toward the end of this period skeletal muscles will respond to faradic stimuli. Following the inactive period is a stage where the skeletal muscles are active, but the source of the stimulation to the central nervous system is not known; one possible source is postulated—changes in the external environment producing activity through sensory nerves and spinal mediation. The active stage becomes reactive when direct stimulation from sensory fibers results in responses which vary with their central connections. Eventually the sensory fibers in many regions of the embryo act simultaneously in such a way that segregation of muscle groups results and inhibition is developed, so that localized stimuli produce fairly restricted reactions in the muscle groups. A generalized sort of inhibition is exerted by regions of the central nervous system lying above the medulla, and such centers are responsible for changing jerky movements into smooth ones. R. L. SOLOMON (Psychol. Abstr.).

2. Pharmacology and Treatment.

Production of Changes in Permeability by Narcotics and Analeptics. Hofmann, H. [*Arch. exptl. Path. Pharmakol.*, **201**, 529–68 (1943).]

An application for measuring the permeability of frog skin is described. Ethylurethan, paraldehyde, amylene hydrate, chloral hydrate, barbital and phenobarbital in subnarcotic concentrations produce a reversible increase in the permeability to ions, in narcotic concentrations produce a reversible decrease in permeability, and in still higher (toxic) concentrations produce an irreversible increase. The effects of two narotics used together are additive. Metrazole, strychnine, coramine and picrotoxin in increasing concentrations produce the same changes in permeability in the same order as the narcotics. The reversible effects of narcotics are antagonized by suitable concentrations of analeptics, and vice versa.

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

Relation of Vitamin B to the Duration of Anesthesia Induced by Pentobarbital Sodium. Higgins, Geo. M., and Mann, Frank C. [*Surg. Clin. North Am.*, **23**, 1205–11 (1943).]

Duration of anesthesia which followed intravenous injections of proportionate amounts of pentobarbital-Na has been determined for ten white rats maintained on (*a*) basal diet, (*b*) vitamin-B-free synthetic diet, (*c*) synthetic diet with vitamin B supplements, and (*d*) the same diet as (*c*), but limited to the amount eaten by rats on (*b*). The average period between injection and awakening was 28·8 minutes for (*a*), 67·7 for (*b*), 26·6 for (*c*) and 37·8 for (*d*). Data indicate but do not prove that rapid destruction of the drug in animals adequately provided with vitamin B was due to a high concentration of these principles in the liver. The liver is rich in these vitamins and is probably also one of the sites for destruction of pentobarbital-Na. However, the factors which make the liver so effective a defense mechanism against some of the barbiturates must await further study. DOROTHY A. MEYER (Chem. Abstr.).

Pharmacology of sec-amyl (2-bromoallyl) Barbituric Acid and of its Combination with Antipyrine. Krop, Stephen, Modell, Walter, and Gold, Harry. [*J. Am. Pharm. Assoc.*, **33**, 10–14 (1944).]

The behavior of the mixture of antipyrine (I) and *sec*-amyl (2-bromoallyl) barbituric acid (II) was investigated in the cat by oral, rectal and intravenous administration. (I), (II) and the mixture (III) are rapidly absorbed by the oral and rectal routes. The persistence of action of (II) is long in the cat. Recovery after doses of 30 mgm. per kgm. (about twice the usual doses used in man) requires an average of about 20 hours. After still larger doses (in the range of those which cause fatalities) recovery takes 2–4 days. The persistence of action in the cat appears to be similar to that in man. The pattern of effects produced by (II) in the cat is similar to that of other barbiturates, viz., fairly marked individual variations, some excitement prior to the narcosis, and a protracted period of excitement and hyperexcitability following the narcosis. (II) abolishes the convulsant action of (I). The effect of (III) depends on the dosage. The dose of (III) (30 mgm. of (I) and of (II) per kgm.), representing about twice the usual amount advocated for use in man, produces effects which in their speed of onset, intensity and duration are barely distinguishable from those of a similar dose of (II) alone, although a suggestive intensification of the depth of narcosis was present. In a higher dosage range (100 mgm. of (I) and of (II)) there is marked synergism; the toxicity of (II) is nearly doubled. On the other hand with (III) in which convulsant doses of (I) are used, there is an indication of antagonism. A few cats were encountered which showed irreversible functional disturbances of the central nervous system, in some after (II) alone and in others after (III). In a comparison of the effects by the rectal and oral routes, the beginning of absorption of the compounds is not materially different, but (III) is only about one-third as effective by rectal as by oral administration; this difference appears to be due to (II), for the toxicity of (I) is practically the same by the two routes. The differential absorption or destruction of the components of a mixture may be pointed out as a source of error in relation to inferences that are sometimes drawn regarding the behavior of a mixture given by rectum, from results obtained through their oral adminstration.

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

Duration of Sleep Produced by Pentobarbital-Na in Normal and Castrated Female Rats. Gaylord, Charles, and Hodge, Harold C. [*Proc. Soc. exptl. Biol. Med.*, **55**, 46–8 (1944).]

When the drug was given in doses of 30 mgm./kgm. subcutaneously, normal rats slept about twice as long as the castrated rats. In both groups the duration of sleep decreased with increase in room temperature in the range 13–37°.

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

Significance of Artificial Respiration in Accidents with Anesthetics of the Barbituric Acid Group. Donatelli, Leonardo, and Ingiulla, Wladimiro. [*Giorn. ital. anestesia analgesia*, **6**, 390–405 (1940); *Chem. Zentr.*, (**1**), 3537 (1941).]

The toxic action and the effect on respiration of the preparations evipan, narconumal, eunarcon, pernocton and rectidon were compared in rabbits. The animals were injected intravenously with 100 mgm./kgm. per hour until breathing ceased; when cardiac insufficiency was evident artificial respiration was begun. All animals which manifested respiratory paralysis from lethal doses could be saved by artificial respiration when it was continued for a sufficiently long period. Under almost the same conditions this could be accomplished easily with evipan, eunarcon and narconumal and with difficulty with rectidon and pernocton. Arterial pressure and cardiac function were only slightly influenced by lethal doses, but rapid failure occurred after respiratory paralysis due to lack of O and excess CO_2. The artificial respiration restored the disturbed circulation and brought the blood pressure to normal. The significance of halogen substitution and the length of the side chains in the preparations were discussed.

HELEN LEE GRUEHL (Chem. Abstr.).

The Action on the Heart of Narcotics of the Barbituric Acid Series. Donatelli, Leonardo. [*Arch. ist. biochem. ital.*, **12**, 209–20 (1940); *Chem. Zentr.*, (**11**), 2838 (1941).]

The Na salts of evipan, narconumal, eunarcon, pernocton and rectidon at concentrations of 0·1 to 0·001 M were tested on the amphibian and mammalian hearts. All these compounds diminished strength of cardiac contraction without influencing the frequency. The Br-containing compounds and those alkylated in the 5-position (eunarcon, pernocton and rectidon) were more toxic.

E. S. G. BARRON (Chem. Abstr.).

Does the Diacetylation of Yohimbine and of Corynanthine Modify the Sympatholytic Action of the Alkaloids? Raymond-Hamet. [*Compt. rend.*, **216**, 614–16 (1943).]

Experiments on dogs in which the diacetyl derivations of yohimbine and its isomer corynanthine and the corresponding unacetylated compounds were tested for their power of inverting a minimal hypertension induced by adrenaline indicated that the presence of the acetyl groups did not modify the sympatholytic action of these alkaloids.

W. H. FISHMAN (Chem. Abstr.).

Action of Anesthetics on the Mineral Composition of the Brain. Serantes, Maria E. [*Anales farm. bioquim. (Buenos Aires)*, **14**, 77–80 (1943).]

When deep anesthesia was induced in rats by intraperitoneal injection of $MgCl_2$ or chloral

hydrate, or by inhalation of $CHCl_3$, the K of the brain increased slightly. Anesthesia with Et_2O caused a slight decrease in K, and urethan caused no change. The Mg of the brain was doubled by the $MgCl_2$, increased 33 per cent. by the chloral hydrate and increased 20 per cent. by the $CHCl_3$. Urethan and Et_2O did not affect brain Mg. The normal average K content of rat cerebrum is 255 mgm. per cent. and the Mg content 153 mgm. per cent.

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

Further Investigation of the Peripheral Results of Localized Pharmacological Action on the Cerebral Cortex. Chauchard, A., Chauchard, B., and Chauchard, Paul. [*Compt. rend. soc. biol.*, **136**, 336–7 (1942); *Chem. Zentr.*, (**11**), 1817 (1942).]

In dogs, nicotine solution applied to the cerebral cortex motor areas for extension and flexion of the toes causes a marked immediate increase in the chronaxie of the paw, followed by a rapid decline to the normal value. This decline corresponds to the appearance of the non-irritable phase of the cortical area. When this phase has begun further treatment with nicotine has no effect. If the cerebral cortex is made non-irritable by general anesthesia the above effects on chronaxie are not observed. (*Cf.*, *ibid.*, **135**, 1340 (1941).)

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

The Effect of Insulin on the Responses of the Frog Heart and Rectus Abdominis to Acetylcholine. Welsh, John H. (*Am. J. Physiol.*, **141**, 109–16 (1944).]

The responses of the isolated frog heart and rectus abdominis muscle to acetylcholine (I) can bs modified by previous administration of insulin to the intact frog. At a temperature (15°) at which the action of insulin on the frog is relatively slow, its effect during the first 24 hours is to increase the responsiveness of the rectus abdominis to (I) and to decrease the percentage inhibition of the heart at concentrations of 10^{-8} and higher. At 25° the responses of the rectus abdominis to (I) at intervals of 6 to 24 hours after insulin are subnormal, and the percentage inhibition of the heart is greater than normal. These changes are not directly related to blood-sugar levels nor to levels of muscle glycogen, but it is suggested that they may be due to changes in the rate of utilization of carbohydrate. E. D. WALTER (Chem. Abstr.).

Preparation and Pharmacological Testing of Acetylcholine Phosphate and β-glycerophosphate. Nagy, T. Vályi, and Mihalik, I. [*Arch. exptl. Path. Pharmakol.*, **202**, 43–59 (1943).]

Moncholine phosphate (I) and monoacetylcholine phosphate (II) were prepared by treating solutions of the corresponding neutral sulfates with $Ba(H_2PO_4)_2$. In like manner monocholine β-glycerophosphate (III) and monoacetylcholine β-glycerophosphate (IV) were obtained by treating the sulfates with monobarium β-glycerophosphate. (I) and (II) are very hygroscopic, (III) is somewhat less so; and (IV) is readily crystallized from water. The pharmacological action of frog rectus abdominis muscle, isolated intestine and blood pressure of cats decreased in potency in the order: (II), (IV), choline chloride, (I), (III).

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

Mechanism of the Action of Sympathomimetic Drugs. XIII. Action of Sympathomimetic Drugs on Sensory Nerves. Orzechowski, Gerhard. [*Arch. exptl. Path. Pharmakol.*, **202**, 80–4 (1943); *cf. C.A.*, **37**, 5781[5].]

The application of a 1–2 per cent. solution of a salt of ephedrine, sympathol, veritol, benzedrine, pervitin or β-tetrahydronaphthylamine to the exposed sciatic nerve of a frog blocked transmission of stimuli in a manner similar to that of procaine. Washing with Ringer solution restored normal conduction. L. E. GILSON (Chem. Abstr.).

Effects of Morphine on Cortical Electrical Activity of the Rat. Cahen, Raymond, L., and Wikler, Abraham. [*Yale J. biol. Med.*, **16**, 239–42 (1944).]

Doses of less than 200 mgm./kgm. of morphine, like moderate doses of barbiturates, had little effect on cortical electrical activity of unanesthetized rats. Large doses (200 mgm./kgm.) or doses of 40–100 mgm./kgm. combined with 9–30 mgm./kgm. barbiturate abolished cortical electrical activity because of the anoxia due to respiratory depression. When artificial respiration was given the cortical activity reappeared. G. H. W. LUCAS (Chem. Abstr.).

Late Effects of Lead Poisoning on Mental Development. Byers, Randolph K., and Lord, Elizabeth E. [*Am. J. Diseases Children*, **66**, 471–94 (1943).]

A study was made of 20 children who had had Pb poisoning in infancy or early childhood and who had apparently made a complete recovery. With one exception, none of the children progressed satisfactorily in school. Conclusion: Pb in the circulation of an infant interferes with the changes normally occurring in the cortex, and in a high percentage of cases prevents normal growth and development of the cortex. E. R. MAIN (Chem. Abstr.).

Influence of Some Analeptics (Metrazole, Coramine, Neospiran and Cycliton) on Body Temperature of Normal and Narcotized Rabbits. Hahn, Fritz. [*Arch. exptl. Path. Pharmakol.*, **202**, 165–93 (1943); *cf. C.A.*, **37**; 5137[9].]

In normal rabbits convulsive doses of metrazole may raise body temperature as much as

2·8°. Coramine, cycliton and neospiran lower the body temperature. In rabbits narcotized with allonal the effects are similar but less marked. L. E. GILSON (Chem. Abstr.).

Carbocholine. Kulakovskii, B. [*Farmatsiya, No.* **1**, 34–5 (1941).]

Carbocholine (I), $Me_3N(Cl)CH_2CH_2OOCNH_2$, is a tasteless, odorless, water-soluble white powder, m. 203–205°. As a stimulant for the parasympathetic nervous system (I) is many times more active than acetylcholine (II). Given *per os*, (I) is slower than (II) to decompose within the body and more uniform in effect in prolonged systematic use. It lowers blood pressure in 10–15 minutes. The effect reaches its maximum in 25–30 minutes, returning to the initial level in an hour. In glaucoma a 0·75 per cent. solution of (I) is as potent as 2 per cent. pilocarpine.

Qualitative tests for (I) are described. An argentometric method of determination is recommended. JULIAN F. SMITH (Chem. Abstr.).

Influence of Drugs and Chemotherapy on Enzyme Reactions. III. Cholinesterases of Brain and Erythrocytes. Zeller, Ernst A., and Bisseger, Alfred. [*Helv. Chim. Acta*, **26**, 1619–30 (1943); *cf. C.A.*, **37**, 1135⁵.]

Human-serum cholinesterase is strongly inhibited by nupercaine, irgamide and isopropylantipyrine, but the cholinesterase of human erythrocytes and brain are only weakly inhibited by these drugs. Morphine inhibits all three cholinesterases and caffeine only serum cholinesterase. Both brain and erythrocyte cholinesterases are inhibited by excess of substrate. From the above and other data the cholinesterases can be classified into two types. Characteristics of each type are discussed. L. E. GILSON (Chem. Abstr.).

Experimental Studies on Headache: Pharmacodynamics of Urine Excreted during Migraine Headache and Its Relation to 17-Ketosteroid Content. Torda, Clara, and Wolff, Harold G. [*J. clin. Invest.*, **22**, 853–8 (1943).]

Urine collected during periods of migraine headache contracted rectus abdominis muscle of frogs to a greater extent than that collected during attack-free periods. During the headache period the 17-ketosteroid content was increased. Other factors in causation of the attack, such as histamine, acetylcholine and K, were ruled out. J. B. BROWN (Chem. Abstr.).

Effect of Certain Sulfonamides on the Electrical Activity of the Cerebral Cortex. Brenner, Charles, and Cohen, Sidney. [*J. Am. Med. Assoc.*, **123**, 948–50 (1943).]

Sulfanilamide or its salt even up to 20 per cent. does not affect the electrical activity of the cerebral cortex, but salts of sulfathiazole, sulfapyridine or sulfadiazine produce striking changes which are attributed to their convulsant action. The general conclusion is that "sulfanilamide is the safest of these four drugs for local intracranial application."

S. MORGULIS (Chem. Abstr.).

Effect of High CO_2 Concentrations on Experimental Convulsions. Moussatche, H. [*Anais assoc. quim. Brasil*, **2**, 80–3 (1943).]

Application of a square of filter-paper moistened with strychnine solution to the motor cortex of dogs anesthetized with morphine produces epileptic convulsions. The convulsive state can be maintained by keeping the filter-paper moistened with strychnine. When 18 per cent. CO_2 is added to the inspired air the convulsions are inhibited at once, and in a majority of cases do not return for some time after normal air is again breathed. Theoretical aspects are discussed.

BRUNO VASSEL (Chem. Abstr.).

Effect of Adrenaline- and of Ephedrine-HCl on Anaphylactic Shock in the Rabbit. Vallery-Radot, Pasteur, Mauric, G., and Holtzer, Mme. A. [*Presse méd.*, **51**, No. 14, 183 (1943); *cf. C.A.*, **38**, 792⁵.]

Adrenaline-HCl, intravenously injected into rabbits in doses varying from 0·001, 0·01, 0·1 to 0·2 mgm. per kgm. does not prevent anaphylactic shock. However, in certain tests a dose of 0·5 mgm. per kgm. produced some protection, although an uncertain one (in 6 out of 11 animals). Intravenous injection of ephedrine hydrochloride in doses of from 5 mgm. to 10 mgm. per kgm. had no corresponding protective effects. R. P. E. HOPF (Chem. Abstr.).

Production of Epileptic Convulsions with Essence of Absinthe. Propper-Grashchenkov, N. I. [*Sovet. Psikhonevrol.*, **16**, *No.* 4, 17–29 (1940).]

Experiments on dogs have shown that the intravenous administration of essence of absinthe is far more effective in producing epileptic convulsions than is suboccipital injection or direct introduction into the cortical or subcortical region of the brain. This indicates that the active substance is carried by the blood-stream repeatedly to the brain-cells and produces with each cycle a distinct convulsion, the interval between them being about three minutes. The chemical action is twofold: (1) the threshold of excitation of the pyramidal cells in the brain is lowered; (2) the irritating effect of the chemical causes overstimulation of these cells, which is the primary cause of epileptic convulsions. This hypothesis is supported by the fact that any therapeutic agent with depressant action is known to relieve the convulsive state.

C. S. SHAPIRO (Chem. Abstr.).

Effect on the Electrical Activity of the Cortex of Certain Depressant and Stimulant Drugs, Barbiturates, Morphine, Caffeine, Benzedrine and Adrenalin. *Gibbs, F. A., and Maltby, G. L.* [*J. Pharmacol.*, **78**, 1–10 (1943).]

The EEGs of six normal men given the above drugs were analyzed by the Grass method. Phenobarbital, pentothal and morphine caused a shift in frequency to the slow side. Pentothal caused a great increase in voltage, morphine less, and phenobarbital least. Caffeine, benzedrine and adrenalin caused a shift to the fast side, comparable to, but not greater than, that occurring with attention. The most depressant drug clinically (pentothal) caused the greatest shift to the slow side, and the most stimulating (adrenalin) the greatest shift to the fast side. A shift of one cycle per second can occur without signs of disturbed nervous function; the shift of four cycles produced by pentothal is associated with unconsciousness comparable to deep normal sleep. Direction of change in frequency was constant for a given class of drugs, but direction of change in voltage level varied with dosage and with drugs of the same class.

M. E. Morse (Psychol. Abstr.).

Action of Intrathecally Injected Prostigmine, Acetylcholine and Eserine on the Central Nervous System in Man. *Kremer, M.* [*Quart. J. exp. Physiol. cognate med. Sci.*, **31**, 337–57 (1942).]

Prostigmine, acetylcholine, and eserine were injected into the lumbar theca of human subjects with no abnormality of the central nervous system and subjects with some form of spasticity of pyramidal origin. Case-studies are presented. Doses of 0·1–1·5 mgm. of prostigmine produced depression of muscle tone and reflexes. Larger doses tended to produce nausea, vomiting, and drowsiness. Voluntary movement was impaired, bladder emptying was temporarily abolished, and "no changes in sensation were ever noted." When prostigmine was injected in patients below the level of their spinal block, the spinal cord depression was limited to the cord below the level of the block. No effects were noted due to injection of 2–500 mgm. of acetylcholine. Doses of 0·25–1 mgm. of eserine sulphate produced an "initial transient depression of spinal reflexes followed by a rapid return to a level exceeding that noted prior to the injection." Eserine also produced "striking sensory changes including facilitation of sensory transmission."

L. C. Mead (Psychol. Abstr.).

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The following names are printed in SMALL CAPITALS: authors of original articles and of books reviewed. Names of authorities referred to in the text are in ordinary type.

(E.) indicates the *Epitome* section; the title of the abstract is followed by the author's name, thus: "Age and human ability. Miles, W. R. (E.)."

The names of authors referred to in the Epitome section are listed in Part II.

PART I.—GENERAL INDEX.

PART II.—AUTHORS REFERRED TO IN THE EPITOME.

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