consisted of two scars, one case of tuberous sclerosis, and one of a glial infarct. The incidence of trauma in seven cases is probably the major aetiological factor, and cerebrovascular syphilis accounts for two cases. The two scars belong to the traumatic category, leaving 37 cases (74%) with unknown aetiology.

These 37 cases were further examined in relation to significant organic and psychological factors. Indirect evidence of probable brain damage, as assessed by E.E.G., A.E.G., skull x-ray film, previous head injury, and positive neurological findings, was found in 30 cases. In 20 of the 37 we found in addition evidence of clear, severe, and unequivocal emotional strain. The only paper that refers to emotional disturbance in late-onset epilepsy is Livingston's (1956), which singles out 6 out of 689 patients as having psychogenic precipitation. In Part II we describe the life situation confronting the 20 cases at the time of the initial precipitation of seizures, and consider the significance of brain damage. Among previous studies, Livingston, using 689 patients over the age of 20 who were initially referred to him after the exclusion of tumours, and metabolic and acute cerebral disease at the Johns Hopkins Hospital, found 78% with unknown aetiology. Berlin (1953), studying 125 men over the age of 34, found an incidence of 50% of unknown aetiology. Du Saucy-Bayloye and Sorel (1959), who examined 265 patients over the age of 40, found 57% with unknown aetiology. It is possible, however, that these cases of unknown aetiology could, in the light of similar investigations to our own, show indirect evidence of brain damage.

The high incidence of temporal-lobe epilepsy is in part related to the special interest devoted to this subject both in investigating and in treating such cases at this hospital (Falconer *et al.*, 1955). At the time of the follow-up all but 5 of the 50 patients traced were still on their anticonvulsants (in this context the five deceased are included—all of whom were taking their tablets up to the time of their death). Improvement was shown by 56%, indicating the benign prognosis of this condition when the full therapeutic measures including surgical intervention are employed (Hill, 1958). This finding and the absence of any evidence of a shorter life expectation in these patients is in agreement with the findings of Berlin (1953), White *et al.* (1953), and Livingston (1956).

Summary

Fifty-one cases of late-onset epilepsy accompanied by psychiatric illness were studied.

Frequency of attacks was not related significantly to the duration of epilepsy nor to age of onset in those under 45 years, but it was related to the type, being greater in the psychomotor ones.

A low incidence of tumours and a benign outcome of the epilepsy found in other studies is confirmed.

Of 40 patients with abnormal E.E.G.s, 26 had a temporal focus.

Patients with normal E.E.G.s had a better prognosis for epilepsy. Small abnormalities in the air encephalogram were frequent and were of particular value when taken in conjunction with other routine tests, especially in the temporal-lobe cases.

There was direct evidence for brain damage in 14 cases and indirect evidence for probable damage in another 30. It is considered that these brain lesions alone or in conjunction with other factors such as emotional strain play a major part in the aetiology.

We would like to thank Professor Denis Hill for permission to examine case notes of patients under his care and for his encouragement and advice in the preparation of this paper. We would also like to thank Mr. Murray A. Falconer and the physicians at the Maudsley Hospital for permission to examine case notes of patients under their care; Dr. R. D. Hoare for the radiological findings; Dr. R. H. Crawley for statistical advice; and Mrs. M. Dewhurst for her help in the follow-up of patients.

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A FOLLOW-UP STUDY OF LATE-ONSET EPILEPSY

II. PSYCHIATRIC AND SOCIAL FINDINGS

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Since the time of Hughlings Jackson (1931) and Gowers, attention has been paid to the role of the emotions in the precipitation of epileptic seizures. Gowers (1901) suggested that fright, excitement, and anxiety are the potent factors. Fremont-Smith (1933) studied 36 unselected private patients between the ages of 10 and 53 and found in 24 of them a close relationship between their seizures and emotional disturbance such as fear, guilt, or frustration. The period of follow-up in this study was three years. Hendrick (1940), studying two patients, Bartemeier (1943) and Greenson (1944), studying one patient each, suggest that aggression which reaches a high peak prior to the attack is responsible for it. Aring *et al.* (1947) accept emotional conflict as the precipitating factor in subsequent attacks after the onset of epilepsy. Barker (1948), describing a typical petit mal patient, concludes that the attack "abolishes consciousness when unconscious emotional demands endanger consciously acceptable patterns of behaviour." All these authors are primarily concerned with the emotional state prior to the occasion of a seizure in established epilepsy. The findings are based on a small series of

cases with a wide scatter of age, and the follow-up period is either not indicated or is limited.

So far as we know no detailed study of late-onset epilepsy with psychiatric illness has been made. This paper examines the psychiatric and social findings in 51 patients seen at the Maudsley Hospital, all of whom were referred initially with epilepsy and a tentative diagnosis of psychiatric disturbance. Details of the investigations and seizure findings are reported separately (Part I). Particular attention has also been paid here to 20 cases whose life situation prior to the onset of their epilepsy contained a severe psychological disturbance of unequivocal character.

The 51 patients (29 males, 22 females) were seen consecutively between 1952 and 1956. Further details regarding these patients are given in Part I.

Psychiatric Illness

A diagnosis according to the international classification was made based on case-note information (Geneva—October, 1947) before the epilepsy began and at the time the patients were first seen in hospital. At the follow-up all surviving patients except one were seen by one of us (J. D. or E. S.) and the psychiatric state was assessed as improved, unchanged, or deteriorated. The findings of one of us (M. D.), letters from general practitioners, and hospital accounts, wherever relevant, were incorporated in this assessment. In the few cases not seen personally by us (dead), the latter information was used. Table I summarizes these findings. Further analysis of the main psychiatric categories revealed a wide range of diagnoses.

It will be seen (Table II) that 12 of the patients had a premorbid personality disorder—four classified as immature; two each as schizoid, paranoid, and inadequate; and one each as antisocial and cyclothymic. Of the 14 patients with psychoneurosis, six showed features of depression, four of anxiety, two of phobic reaction, and one each of hypochondriasis and mixed

psychoneurosis. If the two patients with a psychotic depression prior to the onset of the epilepsy are added to the six suffering from a neurotic depressive reaction then a total of 8 out of the 28 showed a premorbid affective disturbance of depression. When seen in hospital those with personality disorders retained their wide diagnostic distribution. The relative absence of paranoid disturbance and aggressiveness was conspicuous. This is a finding which runs contrary to a view widely held. Searching for a possible explanation, we can contrast these patients with those described by Falconer *et al.* (1958). Their 50 patients were all temporal-lobe cases with a high incidence of Ammon's horn sclerosis in epilepsy going back to childhood. Of our 51 cases, 34 had psychomotor seizures, but there is a marked difference in the age of onset.

Of the 43 patients with psychiatric disturbance on admission, 13 were depressed. To this number a further six should be added who while belonging to another distinct category had features of depression as well, making a total of 19. The age distribution of this group shows a wide scatter covering all ages.

The most noticeable change produced by the onset of the epilepsy was that involving the 23 patients considered psychiatrically normal before. Seven of these showed an epileptic deterioration, four a psychoneurotic illness, two a personality change, two a psychotic illness, and eight remained unchanged. This group of eight psychiatrically normal patients reflects the existing facilities in this hospital for specialized investigation and treatment of temporal-lobe epilepsy. The psychiatric abnormality detected by the referring doctors was not confirmed at the hospital.

E.E.G.s were performed in all cases and are reported in detail in Paper I. No significant relationship was found between the psychiatric state and the E.E.G. findings. There was an interesting trend, however, in that the left temporal focus group showed a greater tendency towards depressive illness. Of the 19 patients with this condition, seven had a left temporal focus, two on the right, and one bilateral.

TABLE I

	Before Onset of Epilepsy	When First Seen	At Follow-up		
			Unchanged	Improved	Deteriorated
Personality disorder	12	12	7	3	2
Psychoneurosis	14	17	11	5	0
Psychosis	2	6	2	1	3
Epileptic "deterioration"	0	8	5	2	1
Normal	23	8	8	0	0
Total	51	51	33	11	6

TABLE II

	Before Epilepsy	On Admission
Personality disorder:		
Schizoid	2	2
Immature	4	3
Antisocial	1	2
Paranoid	2	3
Inadequate	2	1
Cyclothymic	1	1
Psychoneurosis:		
Neurotic depressive reaction	6	9
Anxiety reaction	4	4
Phobic reaction	2	2
Hypochondriasis	1	1
Mixed psychoneurosis	1	1
Epileptic deterioration	0	8
Psychosis:		
Depression	2	4
Paranoid	0	1
Unspecified	0	1
Normal	23	8

Epileptic Deterioration

This condition characterized by a decline of cognitive functions, especially of recent memory, attention, concentration, and judgment, and also accompanied by mood swings, irritability, and occasionally depression, was found in eight patients. The prominent feature in this condition was memory impairment, found in six out of the eight patients. In this small number of cases we did not find any specific association either with type of seizure or with duration of epilepsy.

Epilepsy and Emotional Disturbance

Particular attention was paid to the psychological factors confronting these patients prior to the onset of their epilepsy. No fewer than 20 patients had had, in our view, a severe emotional disturbance before the first seizure. Sixteen of these were under the age of 45, but the various age-groups were proportionately represented. Clinical details are summarized in Table III. Further examination of the nature of the psychological stress indicates that nine cases had a depressive illness, four had a grief reaction to the loss of a loved person, and in seven anxiety and fear predominated. The importance of an affective disturbance in the form of depression and

TABLE III

Onset of Epilepsy	Prior Emotional Disturbance			E.E.G.			Frequency			Outcome			Psychiatric Outcome			Head Injury	Skull	A.E.G.	C.N.S.
	Major	Psych.	Psych. and Major	Normal	Temporal Focus	Non-spec. Abnormalities	Infreq.	Freq.	V. Freq.	Unchanged	Improved	Deterioration	U.	I.	O.				
Half an hour after hearing serious illness of mother-in-law		+			+				+	+			+					+	
2 weeks after birth of 1st stillborn baby			+			+							+						
12 months of depression following death of wife leading to hospital admission. Epilepsy on night of admission		+				+	+				+				(Died)			+	+
8 weeks after death of husband		+																+	
Immediately after death of mother			+			+				+			+					+	
Severe marital strife accompanied by frequent unemployment preceding 10 years			+	+				+		+			+					+	
On day she was arrested by Gestapo		+				+				+			+					+	
Dismissal from work for undue slowness		+				+				+			+					+	
On day of retirement after working for 45 years with same firm	+										+		+					+	
Depressed, commenced O.P. treatment		+				+				+			+					+	
" six months before			+				+			+			+					+	
First attack immediately after husband had coronary	+					+				+					+			+	+
Severe financial difficulties for 2 years prior to onset of epilepsy			+			+				+			+					+	
After retirement had financial difficulties; became depressed, followed by epilepsy within a few days	+					+					+				+			+	
10 months after being captured by Germans; many deprivations and life threatened		+				+					+		+					+	
Became depressed immediately before onset		+				+				+			+					+	
Increasing anxiety and depression for 2 years prior to onset		+				+				+			+					+	
Preceded by death of very dear father and beginning of war; she was a pacifist		+				+				+			+					+	
9/12 of impotence and depression preceded		+				+				+			+					+	
Depressed—had E.C.T.—followed by epilepsy		+				+				+			+					+	
Total	8	7	5	4	11	5	8	4	8	11	9	0	14	4	2	6	3	9	3

grief reaction is shown by the fact that it is present in 65% of these cases. Table IV shows the distribution of the various abnormalities in the 37 patients who represent the total with unknown aetiology, and comparison is made with the particular 20 cases with

produce an improvement in the epilepsy. It is possible, however, that once epilepsy has begun a complex psycho-physical pattern is established, which in most cases is unlikely to be drastically modified by single changes in the environment.

TABLE IV

	Unknown Aetiology (37)	Emotionally Disturbed (20)
E.E.G. focal abnormality	20 (54%)	11 (55%)
Head injury	10 (27%)	6 (30%)
A.E.G. abnormalities	17 (46%)	9 (45%)
Skull x-ray abnormalities	5 (13%)	3 (15%)
No evidence for brain damage	6 (16%)	1 (5%)

psychological disturbance, who are of course included in the total number of unknown. It will be seen that in all but one of these 20 cases there was indirect evidence for brain damage as shown by the E.E.G., A.E.G., skull x-ray, a previous history of head injury, and evidence of C.N.S. involvement in the clinical examination. Furthermore, the abnormalities are equally distributed except for a small but definite trend for a greater incidence of brain damage in the emotionally disturbed group. Liberson (1955) postulated a "reflex" mechanism in which the rhinencephalon is sensitized by local pathology and a seizure triggered off by a sufficient emotional disturbance. Of our 20 cases, 13 (11 from the E.E.G. and two from the A.E.G. angle) provide supporting evidence in favour of this view. In the remaining seven other areas were involved.

The ultimate prognosis of this group for the epilepsy and psychiatric state is not different in any noticeable manner. On theoretical grounds this is a surprising finding. One might have expected the removal of the emotional stimulus to

Social Findings

Social Class.—The patients were classified according to the Registrar-General's Classification of Occupations at three stages—at the start of the epilepsy, on admission to the hospital, and on follow-up. As seen in Fig. 1, before onset more than twice the number of patients were in class III (23 compared with the 11 in classes IV and V). On admission and on follow-up almost the same number of patients were in class III as in classes IV and V together. The total number in class II had also been halved between the period before the onset and on follow-up. It will be seen that on admission there is a downward trend in social class which is not reversed by the time of the follow-up.

Work Record.—The work record of each patient was examined. Those who were in employment more than 50% of the time were said to have a good record and those unemployed more than 50% of the time a bad

FIG. 1.—Social class. S=Start of epile psy. H=Admission to hospital. F=Follow-up.

one. Information was not sufficiently detailed to be more precise than this. Forty-one out of 47 had good records before the onset of epilepsy (87%), 24 out of 37 between onset and admission (65%), and 24 out of 34 by the time of the follow-up (70%). An attempt was made, whenever information was complete, to identify the illness which was known to have affected the work record. These were divided into epileptic, psychological, and physical. Psychological illnesses accounted for 11, physical for 5, and epilepsy in only 1 out of 17 patients whose records were adequate for this assessment.

Marriage.—The marital state was recorded at three different points—before onset, on first admission, and on follow-up. Out of a total of 29 men, five were single up to the onset, one had married on admission, and another by the time he was followed up. Seven out of 22 women were single, and none of these had married by the time of the follow-up. No member of either sex specified epilepsy as the bar to marriage, but the restriction of social activities seen below may have been a contributory factor.

Social Activities.—Various aspects of the patients' social life were looked at at each of the three stages. Taking into account the number of outside contacts, such as organizations to which the patient belonged, the number of close friends or acquaintances he had, and his contact with relatives, the patients were divided into three groups, those with an active, moderate, or restricted social life. As seen in Fig. 2 there is a sharp fall in social activities by the time of admission and only a small increase at the follow-up, which is more marked among men than among women.

FIG. 2.—Social activities. Indications as Fig. 1.

Outcome

The psychiatric outlook is not a good one, as shown in Table V. Of the 42 patients who were found psychiatrically disturbed at the time of their admission to hospital, 25 (60.0%) remained unchanged, 11 (26%) improved, and 6 (14%) deteriorated. These figures ignore the eight patients who remained normal throughout and which if

TABLE V

Seizures	Psychiatric Follow-up				
	Unchanged	Improved	Deteriorated	Normal	Total
Infrequent ..	12	4	3	6	25
Frequent ..	3	3	0	1	7
Very frequent	10	4	3	1	18
Total ..	25	11	6	8	50
Major ..	6	4	4	3	17
Psychomotor ..	7	5	2	2	16
Mixed ..	12	2	0	3	17

included would make a slight improvement to the overall picture. A statistical analysis of the outcome by considering the duration of the epilepsy, psychiatric illness, and frequency and type of seizures showed no statistically significant relationships although of course the numbers involved are small. There was a trend, however, indicating a more favourable psychiatric outcome in those patients in whom the psychiatric disturbance occurred after the epilepsy started, and similarly in those with normal E.E.G.s. When the poor psychiatric outcome is compared with that for the seizures there is a clear indication for the conclusion that when late-onset epilepsy is complicated by psychiatric illness the outlook for these two conditions is different except for epileptic deterioration.

Discussion

Most authors agree about the possible aetiological contribution of emotional disturbance in epilepsy. As a concept it has found small appreciation in the age-group under consideration and next to no experimental verification. Our findings suggest a wide distribution in the psychiatric spectrum with particular prominence of depression both as a manifestation of coexistent psychiatric disturbance and as an immediate pre-epileptic finding. Various theories have been advanced offering physiological mechanisms by means of which emotion may trigger off a seizure. Liberson (1955), reviewing this subject, comments on the facilitating influence of acetylcholine on convulsant activity in experimental animals and suggests that excessive liberation of acetylcholine in excitation may be the responsible agent. Excess of insulin with resulting hypoglycaemia is also postulated, as is a disturbance of cortico-adrenal activity in its relation to electrolyte and water metabolism. Another mechanism he postulates is "reflex" seizures in which certain parts of the brain—for example, the rhinencephalon—is sensitized by local pathology and seizures are triggered off by sufficient emotional disturbance.

So far experimental evidence in favour of these theories is largely derived from laboratory animals. In man, studies along these lines present many difficulties. If we divide the role of emotions to the part they may play in the initial precipitation of epilepsy, and, secondly, to any subsequent contribution to later seizures, it is clear that the first question can only be studied retrospectively.

Stevens (1959) has used the E.E.G. as an investigation tool tackling the second problem. By means of an interview, forearmed with detailed information abstracted from the case history, an attempt was made to elicit strong feelings of anger, sorrow, embarrassment, mirth, or pleasure. Using 30 patients with an established history of epilepsy and nine non-epileptic normal controls, it was possible to precipitate previously unobtained epileptic abnormalities in the E.E.G. in one-third of the epileptic patients and to reduplicate previous E.E.G. abnormalities in another third. The control group failed to show similar changes. The E.E.G.s of the patients with psychomotor attacks showed in particular this phenomenon. An extension of research along these lines is indicated.

Therapy becomes an important issue in the emotionally disturbed epileptic. Aring *et al.* (1947), for instance, treating a very limited number of patients with dynamic orientated psychotherapy claims that this was helpful.

Before such a statement can be made with any degree of confidence the natural course of the disease in this age-group must be known when treated with anti-convulsants alone. The consensus of opinion suggests that the outlook for epilepsy, measured by the criterion of frequency, is good, and this coincides with our findings. The psychiatric prognosis is relatively speaking poor and we have suggested that the course for these two is different.

The statistically non-significant but nevertheless suggestive relationship between the left (dominant) temporal focus group and depression is a finding of some interest. Recent work by Perria *et al.* (1961) and Terzian and Cecotto (1959), who in the process of determining cerebral dominance have been injecting amylobarbitone sodium into the internal carotid arteries, has shown that in addition to contralateral hemianaesthesia, hemiparesis, and hemianopia after injection of the left carotid there was also aphasia and in some cases an acute momentary depressive episode, whereas injection of the right internal carotid was accompanied by a euphoric mood.

Turning to the social findings, it might be expected that when a person starts epilepsy late in life the impact of the disease would be greater than if the patient had grown up with it. This is shown by the noticeable withdrawal from social activities and contacts. The work situation, however, is not so adversely affected, with only one patient having a bad work record as a direct result of epilepsy.

W. A. Kennedy and B. Siccombe, in 1958, in an unpublished paper on 100 consecutive patients attending the Maudsley Hospital Epileptic Clinic, concluded that "the frequency of attacks bore no relation to a poor work record but personality and intelligence were the most important factors." Gordon and Russell (1958) in their study of 400 epileptic patients attending the National Hospital concur with this view, and Pond and Bidwell (1960) found in their survey that no men were unemployable because of fits alone. Our patients would therefore be expected to show a poor work record, as most of them were psychiatrically disturbed. This was not quite the case. A possible explanation is that in late-onset epilepsy the situation may be different. In other words, it is probable that the already developed personal relationship between employer and employee enables the latter to retain the job and the former to tolerate the patient because of his long service. This does not obtain when an epileptic starts looking for a job early on in his career. On the other hand, our patients did not prosper socially—on the contrary, they either remained stationary or regressed in the social scale, which is in accordance with Pond and Bidwell's (1960) findings of "a markedly low social class composition of the epileptic group."

Summary

The psychiatric disturbances of 51 patients with epilepsy of late onset are described.

In 28 cases psychiatric symptoms started before the epilepsy.

A conspicuous absence of paranoid illness was found, whereas an affective disturbance of depression was a prominent feature in the symptomatology.

The possible aetiological significance of emotional stress in precipitating epilepsy in 20 cases where it was

present and its relation to brain damage determined by clinical and laboratory data in 19 cases is discussed.

The outlook for the psychiatric illness was examined and found to be relatively poor compared with the epileptic prognosis.

Social activities, work record, and marital status were examined. There was a downward trend in social class after the onset of epilepsy and an increasing restriction of social activities. The work was not affected by epilepsy.

We would like to thank Professor D. Hill for permission to examine case notes of patients under his care and for his encouragement and advice in the preparation of this paper. We would also like to thank Mr. Murray A. Falconer and the physicians at the Maudsley Hospital for permission to examine case notes of patients under their care; Dr. R. D. Hoare for the radiological findings; and Dr. R. H. Cawley for statistical advice.

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There has been a 45% increase in the number of doctors in Hungary since 1952. This was announced in a survey issued by the Hungarian Central Office of Statistics at the end of December, 1962. The 16,006 doctors in Hungary at the end of 1961 represented one to every 628 inhabitants. The survey points out, however, that though the proportion of doctors in the provinces has increased there are still three times as many doctors per head of population in the capital, Budapest, as there are in the provinces. The situation is, however, better than in 1952, when there were four times as many. Actual figures in 1961 were 35 doctors for every 10,000 inhabitants in Budapest, as against 11 per 10,000 in the provinces. The number of women doctors has more than doubled during the ten-year period under survey. They now represent more than one-fifth (21.8%) of the medical profession. In Budapest 27 out of every 100 doctors are women. On the increase also is the proportion of doctors holding specialist qualifications. This went up from 54 in every 100 in 1952 to 63 in 1961. The number of specialists in the provinces has increased twice as fast as in Budapest. There were 9,637 specialists in Hungary in 1961, of whom 16.3% specialized in internal diseases and 9% in gynaecology. Nearly 60% of Hungary's doctors are working in hospitals, clinics, and local health centres. A further 11% are working at university clinics and research institutes. More than one-fifth are district doctors, Hungary's equivalent of the general practitioner. (Hungarian News and Information Service.)