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THE AFFECTIVE SYMPTOMATOLOGY OF DISSEMINATED SCLEROSIS.

A STUDY OF 100 CASES.

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DISSEMINATED sclerosis is a common nervous disease, in England at least, and its study has formed the subject of numerous volumes, monographs, articles and communications which have dealt with its many aspects, etiological, symptomatological, and pathological, yet we have for long been of the opinion that one of its sides, and that not the least important and significant, has not hitherto received that attention which it assuredly merits. Some reference to the psychical, emotional or affective symptoms of the disease is doubtless a textbook commonplace, and various communications in an enormous literature have been devoted to individual symptoms of the mental series; it is not a little surprising, however, in view of the relative prominence of emotional abnormality in the affection, that this has never been submitted to adequate analysis. In scanning the literature we have often been disappointed with the way in which so significant a group of symptoms has been treated, one of the obvious reasons for which is, that the disease comes almost entirely under the purview of the neurologist, who may not develop the interest or possess the knowledge for such an investigation. Only by collaboration on the part of the neurologist and the psychiatrist, as we believe, can this aspect of the subject be dealt with in a satisfactory manner.

In his clinic at the National Hospital, Queen Square, one of us has devoted much attention to pathological laughing and crying¹ as a symptom of various neurological conditions of the organic category, and, in particular, to the abnormal emotionality that is characteristic of disseminated sclerosis. He

was desirous of prosecuting the subject further with the aid of a psychiatrist, and the present paper is the outcome of an eighteen months' collaboration of this kind which circumstances rendered possible.

For the purposes of this study we have taken one hundred consecutive cases of the disease, male and female, just as they have been met with in the ordinary course. There has been neither selection nor discarding. While the majority have been those of patients in the clinic, we owe the opportunity of examining others to the kindness of colleagues on the staff of the Hospital, and one or two more to other friends. Each has been submitted to a complete neurological and psychiatric examination, according to a scheme the details of which are given in a succeeding section.

INTRODUCTION.

At the outset it is desirable to specify with some particularity the subject-matter with which we are concerned. The 'mental symptomatology' of the disease is capable of the widest interpretation; it may be, and frequently has been, subdivided into intellectual and emotional disorders, while on occasion severer conditions, of the nature of one or other of the psychoses have been observed. The fact remains, that patients suffering from disseminated sclerosis enter asylums very rarely indeed, and that exceptional cases of the kind are insignificant in comparison with those exhibiting, as we shall be able to show, emotional changes which are practically constant. Instead of searching for unusual mental types, we have scrutinised 100 average cases, inclusive of all the best-known clinical varieties, and have investigated both the intellectual and the affective sides of the patients' mentality. Among these 100 cases we have found one or two with exceptional mental symptoms—as will be set forth in due course—but our deductions have been drawn from analysis of ordinary and not extra-ordinary instances of the affection.

The conclusions to which our study has led us are set out at the close of the article; we may say here, by way of anticipation, that we have found that some change in emotional reaction is practically universal, that it occurs with greater frequency than any other symptom whatever, and that it sometimes precedes any of the other manifestations of the disease. Contrasting with this is the relative rarity of an intellectual deficit, except in advancing cases, and then only in a few. We have also paid minute attention to the 'bodily feeling' of disseminated patients, and ascertained significant data the import of which will be duly examined. From consideration of the facts of observation in this series of cases we shall proceed to outline certain hypotheses as to the etiological nature of the disease and its mode of invasion of the nervous system. Further, we shall indicate how the study of the 'mental' symptoms of disseminated sclerosis can throw light on some questions of cerebral physiology.

LITERATURE.

In view of what has already been remarked, any complete survey of the records of cases with mental symptoms is fortunately unnecessary. Every one admits their occurrence, but not even in the elaborate monographs of Müller² and others have we been able to find a satisfactory account of what we are convinced is the actual position in this respect. We append, however, a succinct resumé of some of the numerous previous communications in which our subject is alluded to.

Seiffer³ says the current opinion is, that mental disorders are only slight, being usually described as consisting in an enfeeblement of the intellect and a more or less marked euphoria. He subjected ten consecutive cases to a systematic examination, and in nine he found defective memory, defective association of ideas, and a certain slowness in thinking; he also noted euphoria and labile moods.

Raecke⁴ examined 37 patients, noting marked mental enfeeblement in 13 and other mental disorders in nine. Only in 15 cases was no mental defect observed, and in these the disease was not far advanced. Among the symptoms are specified depressive and maniacal disorders, silly cheerfulness, great irritability, confusion, hallucinations, and delusions.

Reiff⁵ has studied 66 cases from the mental standpoint; in 30, mental symptoms of a definite character were remarked, consisting of dementia (simple or euphoric), and affective disorder (pathologically altered moods, euphoria, depression, apathy, excitability, facile change of mood).

Berger's⁶ statistics are based on the investigation of 206 cases; in only 23 did he find "psychical alterations" in the course of the disease—a percentage of 10.6. This author separates "mental" alterations from those of an affective character, e.g., involuntary laughing and crying, though the two are combined in the above quoted figures.

The most recent statistics are those of Wolfgang Böhmig,⁷ whose tables are based on the examination of 318 cases. Though giving some nine types of initial symptom, none of a mental or affective class is specified by him; he quotes "mental disturbances" as a group of symptoms noted when the definite diagnosis is made, and these he found in only 14, a percentage of 4.7!

Surprising as the last-cited figures are, they are not unique. Writing on the frequency of various symptoms in disseminated sclerosis before the development of the so-called cardinal signs of tremor, nystagmus and scanning articulation, Ashley Mackintosh⁸ does not even mention any mental symptom, emotional or intellectual, as occurring in his 110 cases.

By way of contrast, we will content ourselves with a reference to one or two textbook statements. Jelliffe and White⁹ enumerate as mental symptoms "mild intellectual reduction in the form of a dementia, hallucinatory states with mild confusion, passing ideas of reference and of persecution, difficulty in thinking, spasmodic intermittent alternations in the capacity for attention and concentration, lapses of memory," and add that while they are "for the

most part" absent, they are "more frequent than is usually taught." Distinguished from these are involuntary laughing and crying, which are "very often" found, forced laughing being the more frequent. Neither is usually or of necessity accompanied by the corresponding emotional state, nor does it betoken necessarily any intellectual deficit.

In Oppenheim's¹⁰ experience "the intelligence is often diminished"; the symptom of uncontrollable laughter, "erroneously brought into relation with the decline of mental power," "frequently" appears even in the early stages; "the patient has to laugh against his will, although his mood is not gay."

At the discussion on disseminated sclerosis conducted by the Association for Research in Nervous and Mental Diseases,¹¹ Sanger Brown (secundus) and Davis expressed the opinion that, "counting the euphoria, probably in 90 per cent. of cases there are mental alterations which warrant the meaning commonly granted to the term 'mental symptoms.'" "Many patients" with the disease have a slight elevation of mood which may be termed euphoria. Notwithstanding the organic and progressive nature of the affection, marked mental deterioration is rare. In many cases of long standing changes of this character are "very slight." Of 6,700 insane patients in the Manhattan State Hospital (1921), there were only three cases of disseminated sclerosis.

The striking disparities between the figures and statements which we have chosen to quote can be accounted for mainly in two ways; there is no common consensus of opinion as to what constitutes a 'mental symptom,' and cases have not always, or often, been subjected by the neurologist to an analysis that would satisfy the psychiatrist. Speaking generally, the views and statistics of Sanger Brown and Davis approach more closely to those we shall furnish than do any of the others. These authors, however, offer no explanation of the euphoria and other symptoms of the mental series, nor have they been able to differentiate the actual symptoms as we think requires to be done.

METHOD OF EXAMINATION.

Each case has been submitted to investigation on the lines of the following scheme, which has been drawn up with care and the nature of which has been explained to the patient. Without exception we have had willing co-operation on the patient's part, and in numerous instances, once its tenor has been grasped, he or she has volunteered useful, indeed valuable, information not previously given to anyone, showing how clearly awareness of emotional or other mental change has been present in the mind.

Scheme used in certain Organic Diseases of the Central Nervous System to determine possible Discrepancies in the Emotional Field due to faulty Perception, Association or Expression.

I. EMOTIONAL CONTENT.

Describe in a few words your general or usual mood :

Do you feel consistently cheerful or happy ?

- Do you feel consistently sad or unhappy ?
- Are you naturally optimistic ?
- Are you naturally pessimistic ?
- Are you aware of any alteration in either respect since
the onset of the illness ?
- Are you optimistic or pessimistic in reference to your disease ?
- Do you change readily from a feeling of cheerfulness to one of
sadness, and vice versa ?
- Are you easily amused—
By what you see ?
By what you hear ?
By what you read ?
- Are you easily depressed—
By what you see ?
By what you hear ?
By what you read ?
- Are your moods fleeting or apt to last for some time ?
- Any change in this respect from formerly ?
- Are you naturally phlegmatic or indifferent ?
- Are you anxious or worried ?
- Are you irritable ?
- Do you easily lose your temper ?
- Are you different in mood in any of these respects from what you
were one, two, five, ten, twenty years ago, or before the
commencement of the illness ?

P.II SYCHICAL DETERMINANTS.

- Are your thoughts consistently pleasant ?
- Are your thoughts amusing ?
- Are you inclined to daydream, to live in the future, to live in an
ideal world, or to live in the past ?
- Are your thoughts consistently unpleasant, serious, sombre ?
- Are you inclined to ruminate on unpleasant subjects ?
- Are your thoughts depressing ?
- Are you inclined to worry about yourself ?
- Do you dream ?
- Are the dreams pleasant or unpleasant ?

III. PHYSICAL DETERMINANTS.

- Describe your bodily feeling as a whole—
Are you conscious of any pleasant or unpleasant sensation in your
body as a whole or a part ?
- Do you feel tired or fatigued ?
- Do you feel relaxed ?
- Do you feel sleepy ?

Is the feeling one of bodily ease ? Is the feeling one of contentment ?

Is the feeling one of pleasure ?

Is your general feeling one of malaise ?

Do you feel tense ?

Do you feel nervous or jumpy ?

Have you any feeling of pain, aching, soreness ?

Are you restless ?

Does the performance of normal bodily functions produce pleasant or unpleasant sensations ?

IV. AFFECTIVE CONDUCT.

Do you laugh easily ?

Do you laugh without adequate cause ?

Do you cry easily ?

Do you cry without adequate cause ?

Is your outward expression a reliable gauge of your inward feeling ?

Can you control the expression of your feeling ?

Are you different in any of these respects from what you were one, two, five, ten, twenty years ago, or before the commencement of the illness ?

CLINICAL MATERIAL.

1. *Sex*.—The hundred consecutive cases are made up as follows : male 44 ; female, 56.

2. *Age at onset*.—In Table I are given in decennial periods the ages of the patients at the time when symptoms first made their appearance.

TABLE I. AGE AT ONSET OF SYMPTOMS.

Age Period.					Number of Cases.
10-19 years	..	..	..	..	14
20-29 "	..	..	..	..	38
30-39 "	..	..	..	..	31
40-49 "	..	..	..	..	16
50-59 "	..	..	..	..	1
					100

It is worth mentioning incidentally that in the series the earliest age at which primary symptoms developed was 13 years, and the latest, 55.

3. *Duration of Symptoms at Time of Examination*.—In view of frequent statements to the effect that mental symptoms, using the term in its widest sense, are more likely to be met with in later stages of the disease, we give in

Table II a list of cases enumerating the varying lengths of time the illness had been in evidence when the patients came under observation.

TABLE II. DURATION AT TIME OF EXAMINATION.

<i>Number of Years.</i>	<i>Number of Cases.</i>
1 year or less	15
2 years	9
3 „	12
4 „	9
5 „	6
6-9 years	29
10-19 „	16
20 years or more	4
	—
	100

The extreme limits in regard to duration of symptoms in our series are six weeks, and thirty-seven years, respectively.

From this Table, and from the information just supplied as regards shortest and longest cases, it is at once evident that we have been dealing with instances of the affection of the most varied character, acute, subacute, and completely chronic; if, then, we can show that emotional or affective alteration occurs with constancy irrespective both of the age of the patient and the duration of his symptoms, we shall be justified in our contention that this is a basal symptom, the significance of which cannot be overrated.

4. *Neurological Types.*—Discrimination between differing clinical varieties of disseminated sclerosis is for the purposes of this communication desirable, since the question will arise whether the occurrence of affective disorders is more characteristic of one clinical type than another, or is to be correlated with some particular anatomo-physiological localisation of the morbid process.

A sharp division into distinct clinical types is less difficult in regard to early stages or first symptoms than when there has been some progression of the malady; it is natural for varieties to run into each other, so that the data collected in Table III are to be interpreted in an approximate rather than absolute fashion.

TABLE III. NEUROLOGICAL TYPES.

<i>Clinical Variety.</i>	<i>Number of Cases.</i>
1. Spinal	38
2. Cauda equina and sacral	1
3. Pontobulbar	5
4. Cerebellar	5
5. Ocular	7
6. Cortical	3
7. Mixed or generalised types	41
	—
	100

Neurologically viewed, the cases of the series have included all ordinary varieties and several also that are somewhat exceptional (sacral and cortical classes).

AFFECTIVE SYMPTOMATOLOGY.

As a brief preliminary to our clinical study we consider it necessary to specify some terminological distinctions. It is desirable, for example, to differentiate between physical and mental wellbeing. For the latter we shall use the familiar term 'euphoria,' restricting its meaning to signify the mental state of cheerfulness, happiness, ease—expressed negatively by the absence of mental uneasiness, anxiety, tension, or dispease. We suggest the phrase 'euphoria sclerotica' to indicate that very common affective state of disseminated patients, in which the prevailing mood is one of serenity and cheerfulness. The word 'euthymia' might also serve in this respect. The converse feeling of mental unrest, disquiet, uneasiness, unhappiness, is expressed by the term 'dysphoria.'

In regard to physical or somatic wellbeing we do not consider 'euphoria' appropriate, or, rather, we seek a separate term. As we shall see, a very large number of patients are conscious of a feeling of bodily health, quite different from that of mental wellbeing; in the American phrase, they 'feel good'—an expression meaning rather more than the English 'feeling fit.' They feel physically well tuned up, they 'could do anything,' they are not conscious of physical disability. For this somatic wellbeing we suggest the term 'eutonia sclerotica,' and we shall use 'eutonia' in this sense. Its opposite, 'dystonia,' is commonly employed in respect solely of states of the skeletal musculature (e.g., 'dystonia lenticularis'), but this need occasion no confusion; we shall not be dealing with a 'dystonia muscularis,' but a 'dystonia somatica,' a sense of physical illbeing.

Finally, in this preliminary connexion, we have not infrequently noted an optimism as to the future and the prospects of ultimate recovery which is out of place and incongruous; by analogy with what sometimes similarly obtains in cases of phthisis, we may speak of a 'spes sclerotica.'

I. EMOTIONAL CONTENT (PREVAILING MOOD).

Table IV embodies the results obtained by the examination of our 100 cases of disseminated sclerosis (of both sexes, of wide differences in regard to age, duration and severity of symptoms, and neurological type) as far as section 1 of the questionnaire is concerned, viz., the general, usual, or prevailing mood of the patient.

In amplification of Table IV we ask the reader's attention to Tables V and VI, the source of both of which is the information derived from the same section 1 of the questionnaire. Table V is intended to show what changes, if any, have taken place in the usual mood of the patient since the onset of the illness or during its course, while Table VI represents in statistical form the attitude of the patient towards his disease, that is to say, whether he is cheerful

or the reverse as regards the outlook and whether he has altered in either respect as the disease has progressed.

TABLE IV. PREVAILING MOOD.

<i>Clinical Types.</i>	<i>Number of Cases.</i>
1. Cheerful merry, gay type (Euphoria sclerotica)	63
2. Depressed type (Dysphoria)	10
3. Variable type	12
a. Rapid change of mood type . . .	13
4. Indifferent, stolid type	2
	100

TABLE V. CHANGE IN EMOTIONAL CONTENT (PREVAILING MOOD) FROM ONSET OF ILLNESS, OR SINCE.

<i>Type of Change.</i>	<i>Number of Cases.</i>
1. Change to, or increase of, cheerfulness	63
2. Change to, or increase of, depression	10
3. Increased variability	25
4. Stolidity	2
5. No change	—
	100

TABLE VI. CHANGE IN OUTLOOK, FROM ONSET OF ILLNESS, OR SINCE.

<i>Type of Change.</i>	<i>Number of Cases.</i>
1. Change to, or increase in, optimism (spes sclerotica)	84
2. Change to, or increase in, pessimism	15
3. No change	1
	100

From the data furnished in these three Tables we find that 63 per cent. of disseminated patients exhibit a frank emotional euphoria and only 10 per cent. of them are depressed or dysphoric. Amongst the whole hundred we have found only two who are emotionally indifferent or stolid. By comparison of Tables IV and V (which are statistically identical) we demonstrate that *in every single instance of the affection that has come under our observation in the course of eighteen months a change in mood has been a symptom.* Thus patients formerly cheerful have become more so; a number previously apt to be despondent on occasion, or 'moody,' have become consistently light-hearted and gay; others of variable mood now find this variability intensified and accentu-

ated ; still others (a small minority) have noticed that former mental wellbeing has altered to illbeing, or that so far from cheerfulness and serenity having developed with the disease their previous tendency to depression is increased. Even in respect of the two cases of affective stolidity, we specially note that this emotional indifference is itself a change from their former emotional 'habit.'

CLINICAL ILLUSTRATIONS.

A few clinical examples may now be selected by way of illustration of these changes in the affective field.

CASE 1. W. P., male, age 51 ; duration of symptoms, seven years ; type, spastic.

His spirits are better than ever before ; he feels consistently bright, cheerful, and happy ; he is never sad or depressed, though formerly he became depressed very readily. He is never irritable and does not lose his temper, as he used easily to do. In all these respects the last five years have seen a marked change.

He had been a mate on a sailing vessel and was noted for his callous brutality. When his illness began he observed a direct and definite change, and at the present time his entire range of feeling has so altered that "he cannot now think of cruelty to either man or beast."

CASE 12. A. B., male, age 33 ; duration of symptoms, three years ; type, oculo-spastic.

He is constantly cheerful and "bubbling over with excitement" ; he "turns all his sadness to joy" ; he never worries, is easily amused ; "the least little thing tickles him" ; his cheerful mood is continuous ; "if someone told me that my best friend had committed suicide I should laugh over it as if it were a good joke."

This state is an exaggeration of his previous affective 'habit.'

CASE 24. M. D., female, age 38 ; duration of symptoms, six years ; type, oculo-spastic.

She has moods of "brightness" when she gets excited and laughs immediately ; though inclined to be pessimistic this does not apparently tinge her mood with sadness or interfere with her laughter. These spells of elation are followed very rapidly by moods of depression in which she weeps copiously. Sometimes she is "set to laughter and at other times to tears" ; these "come and go like April showers," and are very fleeting. In all these respects she has changed decidedly since her illness commenced.

CASE 38. R. L., male, age 31 ; duration of symptoms, three and a half years ; type, ocular.

He always feels depressed and melancholic except for a brief period each day, when he becomes unnecessarily cheerful and bright ; this is described as a fleeting period of cheerful excitement coming on usually in the evening, before dinner. He then feels he has no control over himself and sings and laughs without any justifiable reason. After a few minutes he sinks into a deep depression. During the day, apart from the above, he feels gloomy and despondent, worrying over everything and nothing, becoming irritable and impatient.

He states emphatically that this condition of affairs has come on since his illness ; formerly he was very cheerful and optimistic ; whereas ever since his general outlook has developed into one of "gloom and hopelessness."

CASE 35. E. P., female, age 35 ; duration of symptoms, two years ; type, cortical.

Usually "full of life," since her illness she has gone off to the other extreme. She now feels, in her own words, "down and out and far from home." Breaking into laughter, she said, "Excuse me, sir, but I must make a joke of it or I won't be able to get along."

There are brief periods of extreme cheerfulness in which she feels "full of fun and up to any devilment," which come on in the afternoons, last for an hour or two, and disappear with suddenness. Otherwise, she is anxious, worried, uneasy, irritable and depressed.

She has thought a great deal of suicide, but "the whole thing seemed so silly" that she gave it up.

In the above-mentioned ways her emotional condition has altered entirely since the onset of the disease.

CASE 74. B. U., female, age 39; duration of symptoms, 19 years; type, advanced generalised.

The patient feels very cheerful and happy at all times. As a girl she was just the opposite, worrying over things and often depressed. "With my first symptoms I noticed, and others noticed, a gradual oncoming cheerfulness which we all thought very strange, for I had been anything but happy as a girl. I cannot explain reasons for my cheerfulness and happiness. Now I am optimistic but before my illness I was just the opposite."

The other patients in the ward "call me 'Sunshine,' because I am always smiling and laughing."

CASE 77. L. B., male, age 18; duration of symptoms, six months; type, spastic amaurotic.

Always of a cheerful type, he has noticed a marked increase in this since the onset of his illness; anything amuses, nothing depresses him. "I am never, never sad." Optimistic and even-tempered, he says "he is the friend of everyone." When asked the question, "How are your spirits?" the reply came instant: "Doctor, my father can't afford spirits so I keep mine up and make them for him."

Though the symptoms have been in evidence for only six months, this case represents an extreme type of elevation of mood, and will be referred to again in another connection.

We need add nothing to these brief clinical records, chosen almost at random; they exemplify clearly the varieties of affective change to which prominence has already been given and prove unmistakably and beyond cavil that emotional abnormality is a cardinal symptom of disseminated sclerosis whatever the duration, degree, or neurological type of the disease.

II. PSYCHICAL DETERMINANTS.

Section II of our questionnaire was so cast as to include queries which we thought might help in determining possible causes for the euphoria sclerótica characterising, as we have found, 63 per cent. of all cases, for the low-spiritedness exhibited by 10 per cent., and, generally, for the change in emotional content exhibited by all.

Our conclusion is, that under this heading little information of value can be expected, for we have found that in the great majority of cases the answers to the questions were obviously coloured by the prevailing emotional content. In not a few instances the patient was clearly rationalising in respect of his interpretations of his affective symptoms. As might have been surmised, patients of the euphoric group declare almost invariably that their thoughts are pleasant, while the dysphoric group indulge in gloomy thoughts.

For instance, patients of the former class express themselves as follows:

"I lie and think agreeably of my past, which forms a pleasant book from which to read."

"My thoughts are always bright and amusing; I have nothing to think about that is sad."

"I can't think of bad or unpleasant things—it's a waste of time; I look pleasantly forward to the future."

"I never think of anything depressing; I more or less live in the future, when I shall be well again."

"I am always in a good humour and have no reason to think of sad or unpleasant subjects. Why should I? I am doing very nicely."

"There is nothing sad and depressing for me to think of, so why should I hunt for such things? There are happy days to come."

As examples of the ideation of patients belonging to the depressed or dysphoric category the following selections may be cited:

"My thoughts are always sombre and depressing and I do not know what it is to think of anything pleasant."

"I never have bright or amusing thoughts, and am inclined to ponder constantly over depressing things."

"My thoughts are always gloomy and it takes a great deal to raise them; I am worrying about myself all the time."

"I worry about everything; my thoughts go in a circle and are usually unpleasant. There has been a big change in this way since my illness began." (This patient is a hunchback, and emaciated).

"My mind dwells on unpleasant things; the pleasant thoughts go so quickly."

It is interesting to note that in only four cases (four per cent.) was there any tendency to daydream, to live in the future or in an ideal or unreal world. In view of the clinical fact that tendencies of this kind are not uncommon as early, positive symptoms of intellectual deterioration, their relative absence in our group of cases, as well as the lack of evidence of true dementia, indicate the rarity of these states in the disease.

III. PHYSICAL DETERMINANTS.

Valuable data have been obtained in answer to the queries specified in the third section of the questionnaire. Having little or no previous information on the matter of the bodily feeling of disseminated patients to aid us, we have been correspondingly impressed with the remarkable frequency with which our patients have admitted the existence of a feeling of physical wellbeing, even, as we shall show immediately, in cases in which the actual neurological condition was advanced and severe. The accompanying Tables give the reader the figures.

TABLE VII. CLASSIFICATION FROM STANDPOINT OF
BODILY FEELING.

<i>Condition.</i>	<i>Number of Cases.</i>
1. Sense of physical well-being (Eutonia sclerotica)	84
2. Sense of physical ill-being	6
3. Mixed or combined	9
4. Indifferent	1
	—
	—
	100

TABLE VIII. CHANGES IN BODILY FEELING FROM ONSET OF ILLNESS, OR SINCE.

Type of Change.	Number of Cases.
1. Change to physical well-being ..	11
2. Increase of physical well-being ..	77
3. Change to physical ill-being ..	4
4. Increase of physical ill-being ..	2
5. Change to indifference ..	1
6. No change	5
	100

As was emphasised in a previous paragraph, a clear distinction is to be drawn between euphoria, a sense of mental wellbeing, and eutonia, a sense of physical wellbeing. So far as is known to us, no analysis of the latter has hitherto been conducted in respect of sufferers from disseminated sclerosis ; and as our investigation has proceeded we have been more and more impressed by the accumulating clinical data. In numerous instances, further, the patients themselves have, previously and independently, been more than a little amazed at the apparent incongruity between their sense of bodily ease and health and their actual crippled state. Of this examples are given below. We know of no other organic nervous disease, progressively paralysing in character, of which the same can be said, and we consider *we are fully justified, therefore, in attaching fundamental significance to eutonia sclerotica*—a symptom as basal as is euphoria sclerotica. According to our statistics, 84 per cent. of disseminated cases, of all sorts, duration and degree, are characterised by a feeling of bodily ease, comfort and health on the part of the patient. In only six per cent. has a sense of physical or somatic illness been present—a percentage that accentuates the predominance of the other by its very lowness. Finally, no less than 95 per cent. of our patients have exhibited a change in bodily feeling since the illness has started.

It will be our object at a later stage to analyse this peculiar and unexpected symptom from other viewpoints ; at present some descriptive illustrations of the varieties may be supplied.

CLINICAL ILLUSTRATIONS.

As before, instances may be taken almost at random ; we select those in which the symptom has been personally observed by the patient, or which exhibit striking contrasts between it and the neurological stage of the disease, or which, for other reasons, are worth citation.

CASE 37. G. B., female, age 26 ; duration of symptoms, four years ; type, oculo-cerebellar. She is so conscious of physical well-being that she “ feels she could get up and dance about.” She has much more pleasant physical feelings than she had before her illness. She used sometimes to feel as if “ she were carrying a ton weight ” ; now she feels fit to do anything. She feels sure she enjoys everything much more than she did before her illness began. Her somatic state is one of extreme ease and pleasure.

CASE 40. J. W., female, age 49; duration of symptoms 12½ years; type, spastic.

As she lies in bed she feels she has the ability to do anything; she "could jump out of bed and run about like a child." The feeling is one of complete contentment, ease and pleasure, which has become more pronounced since her illness. It is interrupted from time to time by her "jerking spasms," which are painful; when these cease her physical feeling is "perfect."

CASE 43. A. R., male, age 22; duration of symptoms, six months; type, oculo-spino-cerebellar.

The patient says "he never felt better physically"; he has felt much better since the commencement of his illness; in bed he feels pleasantly relaxed and perfectly at ease. He says definitely that his feeling is one of "bodily pleasure" and that "he has not a complaint in the world when lying in bed." He has observed a marked change in this respect from the outset.

CASE 56. W. F., age 40; duration of symptoms, 12 years; type, oculo-spastic.

Although this patient is now practically unable to stand or walk he declares he feels perfectly fit and when sitting or lying down is conscious of a soothing feeling "as if he had been drugged." This has been noticed since the beginning of the illness. When trying to move about he is conscious of numbness and pain in his limbs, but when at rest he feels "he is capable of performing the most arduous task." This "feeling of extreme bodily pleasure is almost unexplainable."

CASE 78. M. R., female, age 49; duration of symptoms, 3½ years; type, generalised (advancing).

Physically, she feels perfectly fit. She says, "You will not believe me, sir, when I say that I feel thundering well." Though bedridden and unable to stand, she feels much better than ever before, enjoying her food, sleep, and everything more since her illness than previously. Her somatic feeling is one of ease and pleasantness at all times.

CASE 83. J. S., male, age 46; duration of symptoms, four years; type, ponto-cerebello-spinal.

"In myself I feel better than ever before in my life," except for the weakness of the legs. "In fact, I feel so well that I fool myself; I think I can do anything, but when I start my legs begin trembling and I am done." He is never conscious of any physical feeling of unpleasantness or uneasiness.

CASE 90. A. R., female, age 16; duration of symptoms, two months; type, cerebellar.

The patient feels extremely fit in every way. "I feel so happy that I could sing and so well that I could dance all day long." She is never aware of the slightest feeling of physical discomfort. She is always pleasantly at ease, and feels better now than she did before she was ill.

CASE 21. H. S., female, age 47; duration of symptoms, 23 years; type, spastic.

Her bodily feeling is unpleasant. She feels "helpless," as if she cannot move; it is a sort of "aching soreness." She feels jumpy and restless.

CASE 24. M. D., female, age 38; duration of symptoms, six years; type, oculo-spastic.

The patient complains of pains in the arms and head, and of feeling tired and fatigued. She does not sleep well and is conscious of a general feeling of physical malaise. She is restless and feels "strung up."

The last two of this selection belong to the dystonia group, while the others exemplify clearly the astonishing eutonia sclerotica of which we have spoken. In a number of instances we have noted that the latter feeling is apt to disappear whenever the patient moves or attempts to move, a point to which we shall return in our discussion of individual symptoms on a subsequent page.

IV. AFFECTIVE EXPRESSION AND BEHAVIOUR.

The fourth section of the questionnaire deals with the common and well-recognised emotional instability of disseminated patients, in respect, that is,

of outward behaviour and expression. Everyone knows the laughing and smiling type of patient, where the symptoms are so characteristic as to be of pathognomonic value; less common but equally distinctive is the type particularised by alternation of smiles and tears. So prominent in the clinical picture of the average case is this emotional 'facility' and exaggeration that we have come to regard it as constituting a symptom more fundamental than any specified by Charcot years ago in his famous symptomatological triad. To this point also we shall return at a later stage.

Table IX classifies our cases from the standpoint of emotional affect or expression.

TABLE IX. EMOTIONAL AFFECT (OUTWARD EXPRESSION).

<i>Varieties.</i>	<i>Number of Cases.</i>
1. Smiling and laughing type (constant)	71
2. Smiling and laughing plus crying ..	19
3. Rapid change type	2
4. Crying type (constant)	3
5. Stolid type (outward expression) ..	4
6. Exceptional types	1
	—
	100

If we take varieties 1 and 2 together, we find that in no less than 90 per cent. of all disseminated cases smiling and laughing are obvious features, the more noticeable because they occur in season and out of season, so to say; under slight provocation, at the bidding of minimal stimuli, they make their appearance when there is certainly no obvious warrant for them. If we include varieties 3 and 4 also, then the percentage rises to 95, hence only one conclusion is possible—that *emotional facility and overaction form one of the cardinal symptoms of the disease.*

It is of interest to analyse the series in regard to any changes in this respect which have been remarked by the patients themselves, or have become plain to others, since the beginning of their illness, and this is done in Table X.

TABLE X. CHANGES IN EMOTIONAL EXPRESSION FROM THE ONSET OF ILLNESS, OR SINCE.

<i>Type of Change.</i>	<i>Number of Cases.</i>
1. Increased smiling and laughing ..	76
2. Increased crying	4
3. Increased smiling, laughing and crying	16
4. Decrease in smiling and laughing, no tears	1
5. No change	3
	—
	100

From this Table the reader will learn that 96 per cent. of cases of disseminated sclerosis exhibit increase of emotional overaction, whatever the degree or duration of the illness and whatever the grouping of its neurological symptom-complexes. In one case only was emotional expression diminished in its manifestations (one per cent.). Combining the statistical information of Tables IX and X, we see that 95 out of 100 cases of the disease are distinguished by facility and amplification of emotional expression (affect), and that in 96 out of 100 there has been a change in this respect since the illness began. The stolid and 'no change' cases form the trifling minorities of four and three per cent. respectively.

Lest it should be thought, on the other hand, that this striking symptom is always as obvious to the patient as it is to the examiner, we provide figures in Table XI from which it will be seen that not all patients are aware that their emotional behaviour is scarcely normal.

TABLE XI. INSIGHT INTO EMOTIONAL CONDITION.

<i>Clinical Type.</i>	<i>Number of Cases.</i>
1. Awareness of emotional change; conservation of intellectuality ..	87
2. Ignorance of obvious emotional change	11
3. General intellectual deterioration ..	2
	—
	100

Excluding the two cases in which general mental disintegration has been taking place, we note that 11 per cent. of our patients have failed to observe their altered emotional affect, while no less than 87 per cent. have remarked it and in many instances been impressed by it.

The next matter connected with this same question bears on the presence or absence of control over emotional manifestations.

TABLE XII. CONTROL OVER EMOTIONAL AFFECT
(EXPRESSION) SINCE ONSET OF ILLNESS.

<i>Type.</i>	<i>Number of Cases.</i>
1. No change in emotional control ..	3
2. Loss of, or imperfect, control ..	97
	—
	100

No descriptions, however elaborate, are needed to intensify the impression left on the mind by these bare percentages (Tables IX, X, XI and XII). The conclusion is, that *no single symptom of the neurological series (nystagmus, tremor, scanning speech, paraesthesiae, spasticity, amaurosis, etc.), occurs with anything like the same frequency in an unselected century of cases of the disease,*

and that the cardinal symptoms are not neurological, in its limited sense, but belong to the emotional, affective, and visceral spheres, and are constituted by :

1. *Change in mood ;*
2. *Change in bodily feeling ;*
3. *Change in emotional expression and control.*

We shall select a few cases exhibiting emotional exaggeration, taking instances on the one hand where it is in accordance with the patient's inward feeling, and on the other where it is incongruous with his mood or the psychical content of the moment. One or two examples of the stolid type will also be furnished.

CASE 5. S. C., male, age 19 ; duration of symptoms, two months ; type, astereognosis, cerebellar.

He smiled constantly during the examination. "During the past year my family and friends have all spoken of my smiling and laughing." He feels like smiling all the time, simply because he "feels so bright."

CASE 21. (see page 14). The patient is always smiling and cannot control this expression. All questions are answered with a smile, which often passes into laughing without sufficient cause. She states she "has a good cry about once in five years" ; when this happens she cries for weeks at a time and is not able to stop. It was first noticed just after the onset of her illness ; she was working in a chemist's shop at the time and a woman brought in a prescription which somehow started her crying, and nothing would stop it for three weeks ; she saw several doctors but "none could stop her crying." The emotional exaggeration, however, was not accompanied by any feeling of depression.

When describing these attacks of crying the patient was smiling and quietly laughing throughout.

CASE 34. D. B., female, age 28 ; duration of symptoms, 8 years ; type, oculo-cerebello-spastic (advanced).

The patient is constantly smiling and laughing both with and without cause ; she does not cry and has no inclination to cry. She states that the outward expression is a reliable gauge as to her inward feeling, but she cannot control it. She has changed definitely in this regard from the commencement of her illness.

During a long examination it seemed as though there was a permanently established basic affect of continuous smiling with periodic exacerbations into laughter. These emotional rises came on at irregular intervals of half a minute to a minute and were without apparent cause.

CASE 35. (see page 10). This patient smiles and laughs very easily and without cause ; she "wants to cry, but cannot." Instead of crying she finds that she expresses the emotion with laughter. "Her face is a smiling mask which covers her real emotions." Often depressed, during the examination she burst into laughter at frequent intervals, though in reality feeling sad. The change in this respect has been very obvious during the last six months.

CASE 39. A. B., male, age 32 ; duration of symptoms, 18 months ; type, spastic.

The patient smiles and laughs constantly ; "it takes no effort for me to smile or laugh—in fact I can laugh at five o'clock in the morning." Even though "down in the mouth" he is never in tears. "A damned good laugh means more to me now than anything." There has been a definite alteration in this respect since the illness began.

During examination he kept laughing in an exaggerated way.

CASE 42. E. C., male, age 36 ; duration of symptoms, 18 months ; type, spastic (unilateral, leg).

Since the commencement the patient has found that he smiles, laughs, and cries with much greater facility than before, and often without sufficient cause. During the interview he displayed the double affect of laughing and crying, there being more tears than laughter, and he became quite vexed with himself because he could not control his emotional expression.

CASE 52. B. T., female, age 33; duration of symptoms, 6 years; type, oculo-ataxic (with pain).

Often sad, depressed, and worried, the patient has frequently had thoughts of suicide; she is amused by nothing and cannot now see a joke. In respect of mood she has changed diametrically since the beginning of her illness. Notwithstanding the constant background of sombre mood and of depressing thoughts she smiles and laughs almost all the time, even more than she used to do when she was in perfect health. This also worries her, for "she cannot cry when she should," so that her outward expression means nothing and cannot be controlled. Here also is an absolute emotional change since the illness.

While talking of her suicidal thoughts her face is wreathed in smiles and she bursts into laughter, so that there is extreme incongruity between the emotional content and the affect or expression.

CASE 45. G. C., male, age 45; duration of symptoms, 14 months; type, oculo-cerebellar.

The patient complains of always being sad, miserable, and depressed. Formerly cheerful, he noticed the change of mood just before the first physical symptoms appeared.

He never smiles or laughs unnecessarily, nor does he cry. Always more or less of the stolid type in regard to emotional expression, he has not noticed any change in this respect since the illness began.

CASE 61. R. M., female, age 43; duration of symptoms, 3 years; type, spastic, with incontinence.

The patient feels now that her mood is one of unchanging sadness, unhappiness, and hopelessness. She never laughs or smiles or cries; since the beginning of her illness she has noticed less and less inclination either to smile or laugh; on the other hand there has been no weeping, notwithstanding the depression of spirits. She can always control her emotional expression and considers it a reliable gauge to her feelings.

CASE 65. E. R., male, age 25; duration of symptoms, 2 years; type, cerebello-pontine.

Always cheerful and jolly, the patient laughs and smiles continuously, much more so than previously. He exhibits a sense of remarkable physical wellbeing (eutonia), and while being examined was constantly laughing. When asked about tears he said he cried for the first time for years about three weeks ago. "My chum died of consumption and I cried at his funeral"; while saying this he burst into peals of laughter.

ANALYSIS OF INDIVIDUAL SYMPTOMS.

We shall now attempt a somewhat closer analysis of the main affective symptoms which we have differentiated, examining also any interrelationship that they may appear to show. It is convenient to begin with the outward emotional expression, the affect, of the patients who suffer from the disease.

I. EXAGGERATION OF EMOTIONAL EXPRESSION.

As we have already seen, 95 per cent. of disseminated patients exhibit a quite obvious emotional overaction, 87 per cent. are aware of it, and in 97 per cent. control over it is lost or imperfect. In by far the greater number of the cases the expression is 'set' to smiles or laughter (71 per cent.); it is 'set' to tears in only three per cent.; in 19 per cent. laughing and crying

alternate. Only three cases have been found out of the series of one hundred where no particular emotional change in this respect has followed the illness.

With these figures before us, we are justified in the contention that the symptom is causally associated with the disease. No ascription to external circumstances such as environment, to factors such as the duration, degree, or neural type of the affection, to psychological determinants such as are mentioned in the questionnaire, to accidental matters such as the domestic, financial, etc., situation, can possibly explain all the data or offer a solution satisfying all our clinical instances. This being so, the question arises whether the affective expression does or does not correspond to the psychical content of the individual at the time of its exteriorisation, whether it is to be taken as indicative of the patient's mood or not, whether, in short, it is a neurological sign relatively empty of psychological meaning. In the appended Table XIII the term 'congruity' stands for harmony between the external expression and the internal emotional feeling.

TABLE XIII. RELATION OF EMOTIONAL EXPRESSION
TO EMOTIONAL FEELING.

Type.	Number of Cases.
1. Congruity	34
2. Incongruity	48
3. Mixed (sometimes 1, sometimes 2)	15
4. Exceptional types	3
	—
	100

The three exceptional cases are as follows: (1) according to the patient, the increased affect (laughing) was due to his increased capacity for seeing a joke, to augmentation of his "sense of humour" since the onset of his disease. This, however, may be pure rationalisation. (2) In one instance, the condition clearly approached that known as 'Witzelsucht' ('joking-ailment'), the patient treating everything in a jocular fashion, and turning serious things into a joke. (3) In one case, the symptom was associated with an incomplete thalamic syndrome.

In respect of the others, we note that in about one-third emotional expression was appropriate, in about one-half, inappropriate. Even when correct enough, however, it still showed the clinical features of exaggeration and of imperfect control; hence the difference from the normal is constituted solely by a distinction in control and in degree.

On the other hand, we wish to emphasise the fact that the clinical manifestations have seldom been such as to merit the description of *rire et pleurer spasmodiques*. In no more than a small minority was the laughter invincible, the tears torrential; much more commonly was the expression smiling, or tearful, with but occasional exacerbations. It rarely resembled that seen

with frequency in pseudobulbar paralysis—a distinction which cannot be without significance.

So pronounced is this facility of outward expression that we have long since come to regard it as of immediate diagnostic value; when in a young person answers to simple routine questions are accompanied by gratuitous and uncalled for smiles or laughs disseminated sclerosis at once becomes a diagnostic probability. In various of our cases facility and exaggeration of affective display have been the earliest symptoms of the malady, before any somatic neurological sign has made its appearance; further, once the symptom is established it remains a permanent feature of the disseminated syndrome. We examined a patient (Case 16) who was *in extremis* by reason of septic absorption from large bedsores and who died four days later; notwithstanding the desperate physical condition of the woman she said she felt "she would be all right later" and accompanied her talking with easy smiles and laughter. Clinical illustrations have already been furnished of the trifling nature of the stimuli which prove sufficient to set the patient off into laughter, or, on occasion, tears; indeed, in not a few instances the observer has been unaware of any cause, however insignificant, for the emotional exhibition. It would almost appear, in some cases, that mere use of the facial musculature in voluntary innervation, as in talking, is enough to precipitate involuntary (affective) innervation.

The possible pathogenesis of the symptom is discussed on a later page.

II. EMOTIONAL CONTENT (PREVAILING MOOD).

The all-important consideration in regard to the emotional content of the patients we have had under observation is formed by the fact that in 100 per cent. a change has taken place since the commencement of the illness. This change in mood, therefore, while not always in one and the same direction (emotional euphoria, 63 per cent.; emotional dysphoria, 10 per cent.; increased variability of mood, 25 per cent.), is as outstanding a feature of the disease as any symptom of the neurological series individually; it has, however, to be looked for. It has been found in the most unlikely subjects, and is independent of the clinical type of the affection and of its duration and degree. As with the emotional expression, it constitutes in some instances the earliest manifestation of the disease.

An instructive comparison can be made by a glance at Tables IV and IX above. From these it will be seen that while emotional depression, a sense of mental illbeing, characterises 10 per cent. of cases, in only three per cent. is it exteriorised in the form of persistent tears. That is to say, affective dysphoria must in a percentage of cases coexist with an emotional mechanism of expression that is set to smiling or laughter. Conversely, while in 63 per cent. euphoria sclerotica is predominant, in 71 per cent. the outward expression is one of constant smiling; in other words, more patients display outward emotionalism than are justified by their prevailing inward mood. Thus from

another standpoint the same conclusion is reached as is deducible from Table XIII, viz., that incongruity fairly often obtains as between mood and affect.

The alteration in prevailing mood has in many instances been noted not only by the patient but also by relatives and friends (cf. Case 74, p. 11); it has become so striking, in some cases, as to constitute almost a change in personality (cf. Case 1, p. 10). Marked fluctuations in mood, often abrupt, brief, and rather inexplicable, have characterised other cases (cf. Case 35, p. 10). Thus a young woman (Case 64) whose sole neurological symptoms consist of very mild spastic paraplegia of one year's duration, has changed from a bright, cheerful and optimistic person to being mournful and depressed; yet almost every afternoon she experiences a brief feeling of happiness and cheerfulness, which vanishes as abruptly as it comes. Conversely, another young woman (Case 73), who also suffers from mild non-progressive spastic paraplegia, feels continuously good-humoured and "jolly," but she has occasionally noticed, late in the afternoon, fleeting periods of "deep sadness" without any apparent cause or reason; they last only a few minutes and are then lost in her usual mood of cheerfulness.

We are well aware that variability of mood characterises many individuals who do not suffer from organic nervous disease, and that differing emotional types in this respect can be distinguished among normal persons; further, we do not ignore the importance of recognising constitutional or innate dispositions and temperaments behind the affective phenomena of our series of disseminated patients. But the fact remains that in every case it has been our endeavour to ascertain *changes* as compared with the years previous to the onset of the physical symptoms, and it is these definitely established changes which form an affective symptom of prime significance. Of the genuineness of this alteration of mood, whether in the direction of euphoria, dysphoria, or increased fluctuation, we have no doubt.

III. BODILY FEELING.

From what has already been said, the very frequent occurrence of a sense of physical wellbeing (84 per cent. of all cases) must be accepted as one of the remarkable and somewhat unexpected symptoms of this peculiar disease. Eutonia sclerotica has been noted in the most unlikely cases, and has on occasion provided a striking contrast when compared with the actual physical disability or incapacity, not to say paralysis, of the patients concerned. To some of the more intelligent it has appeared "almost unexplainable"; others it has actually misled into supposing that they "could do anything"—until they make the effort.

We note in the first place that this symptom is independent of the neurological type of the affection, as well as of its duration and degree. It is to be found at early stages and at late. In the next place, it is not conditioned by mental euphoria, since a larger percentage exhibit the former symptom than the latter (63 per cent.). Some patients feel well physically but not

mentally, though this particular combination is rare. Again, once the symptom is established it does not tend either to disappear or to become subsequently modified. Even the patient whose case has already been made the subject of allusion (Case 16, page 20) and who was almost moribund when examined, declared that physically she "felt all right" and was neither tired nor weary but quite at her ease.

Naturally enough, perhaps, most of those who have been questioned have stated they are most conscious of this bodily wellbeing when in bed and at rest; a fair number, further, have commented on the fact that it seems to lessen or vanish when they move their limbs or body, presumably since it then comes into conflict with somatic actualities. However this may be, it is clearly more than a mere restfulness of body, for again and again we have been assured it is such that the patient feels he could get up and do anything he wanted. Once more, while the sense of eutonia sclerotica is sometimes interrupted when painful involuntary flexor spasms occur, as in some paralytic cases, it is not constituted negatively by a mere absence of physical pain; it is a positive and not a negative symptom. The patient is conscious of an apparent physical energy and power which he does not in fact possess (cf. Case 83, page 14).

We have found a physical dystonia in only six per cent. of all cases; the physical malaise of these six seems to depend, it is true, largely on persistent pain, though not entirely so. In one instance it was definitely associated with sleeplessness. Searching for a possible cause in the localisation type of the affection, we have not been able to satisfy ourselves that it is the outcome of any special visceral involvement of neural origin; the pontobulbar group do not exhibit it.

When the symptom of eutonia sclerotica is thus surveyed, its independence of any special causative symptom or symptom-complex seems definitely determined. It is common to all types and is met with at all stages and is in no sense merely the outcome of a particular combination of mental and somatic states. We consider it is a primary phenomenon, and not secondary, and in this respect it takes its place with the other affective symptoms under review.

IV. OPTIMISM (SPES SCLEROTICA).

From Table VI above it will be seen that the great majority of disseminated patients (84 per cent.) are optimistic about the future and their prospects of ultimate recovery, a minority (15 per cent.) being less hopeful, or pessimistic. The former very high percentage is patently more than might reasonably be expected when the individual cases are reviewed as regards their degree of involvement of the central nervous system, and suggests the conclusion that in many instances this spes sclerotica is itself a symptom, comparable in some ways to what is known to obtain in general paralysis and in advancing cachectic conditions such as pulmonary phthisis. Indeed, it does not appear to be greatly different from the latter, so-called spes phthisica, but it is not so much

related to the facts as they are met with in cases of the former. Our intention to restrict the term 'euphoria' to mental wellbeing has already been made sufficiently clear; in general paralysis the patient often feels (unreasonably) fit, mentally and physically, but this euphoria is not the same as optimism, and while in a few of our cases the condition does in fact resemble what is frequently encountered in general paralysis, in the majority it is dissimilar.

Analysing this *spes sclerotica* as it is observed in our series, we cannot see that it is dependent on, or arises out of, existing euphoria of mood. It is more frequent than the latter, as a fact, and if occasionally appearing to be the outcome of prevailing euphoria it is so in only minor degree. In our opinion it is a purely mental phenomenon, whereas, as will be pointed out shortly, the euphoria may in one sense be regarded as an erroneous interpretation of physical stimuli, as though feeling-tone were so raised as to be comparable to certain conditions of mild narcosis or mild alcoholism. Similarly, we do not find that *spes sclerotica* is conditioned by the occurrence of physical eutonia, its relation to the latter being no more than incidental, as in the case of euphoria. The association of all three, however, is at once very obvious, as our Tables prove.

PATHOGENESIS OF AFFECTIVE SYMPTOMS.

Leaving this somewhat detailed analysis of the clinical data concerning changes in mood, expression, and bodily feeling, we must now approach the question of their possible pathogenesis, with which is bound up that of their possible relation to disorder of cerebral mechanisms. At the outset we wish to make our position clear. Disseminated sclerosis is a serious and, so far, incurable, organic disease of the central nervous system. With no preconceived ideas as to the etiology of the remarkable series of affective symptoms which characterise that disease more definitely even than nystagmus, tremor, dysarthria, or paraplegia, we have failed to find any psychical determinants worthy of the name for them. It has often been pointed out that from the neuropathological side the affection is one practically *sui generis*; from the standpoint of its affective symptomatology it is equally unique and peculiar. The consensus of present day opinion assigns to it a toxic or toxi-infective origin; our attempt at an explanation of the affective symptoms will be based on the hypothesis that, like the somatic symptoms, they arise from invasion of cerebral mechanisms by a toxic agent. No convincing argument for a psychogenic origin can be advanced, as we hold; on the contrary, the whole trend of clinical investigation suggests the opposite. In addition to the psychological and neurological examinations specified, we have, where there was the slightest indication of possible intellectual defect or psychotic taint, submitted such cases to a formal psychiatric examination, and have kept them under close observation in the hospital wards for a suitable period. These cases, moreover, were studied more elaborately than the others in order to determine whether or not there might be some dormant personality disturbance which might account for the facts of the emotional series.

After careful observation we were able to demonstrate, in only two cases, any signs of actual intellectual deterioration. In one case there was a definite memory defect, with failure of discriminatory powers and judgment. This case was somewhat suggestive of a mild degree of senile dementia. The second case was very much like the first in showing a slight degree of intellectual enfeeblement, with defects of memory as the most positive symptoms. In none of our cases were we able to demonstrate delusional or hallucinatory tendencies. No cases showed evidence of schizoid cleavage. In a relatively small number of cases attention seemed somewhat below the normal level; this phenomenon, however, was put in its proper place by careful observation, and proved to be due to a hyperreceptivity both in the psychic and physical fields which, for the moment, produced an apparent lowering of attention. In a few cases this symptom was somewhat comparable to the condition found in a mild hypomania. We found that retention was good in all cases except the two in which we found actual deterioration. As we were aware that in the past some observers had noted a mental condition which they described as hysteria, we were especially careful to be on the lookout for suggestive symptoms. In not one case in our group were we able to demonstrate a symptom-complex which we could rightfully call hysteria. It is true that the vast majority of our cases have shown an emotional facility which is superficially somewhat like hysteria; however, none has exhibited a narrowing of consciousness or other psychic limitation similar to that found in hysteria or any other psychoneurotic symptom-complex. A few cases offer a limited similarity in emotional expression to that exhibited in mild affective states, but the majority have shown an affective picture which is like no other psychiatric entity that we know of at present.

(1) *Emotional Overaction in Expression*.—One of us has already studied the whole question of involuntary or pathological laughing and crying in a paper which appeared in this JOURNAL,¹ and has there adduced evidence which goes to prove that the neural path for 'involuntary' innervation of the facial (and other) musculatures in emotional expression is distinct from that for 'voluntary' excitation of the same muscular groups, which is unquestionably the corticopontine, corticobulbar, and corticospinal tract. As a general rule, emotional overaction is most in evidence when the 'voluntary' corticifugal paths exercise imperfect control over pontine and bulbar motor centres; this is seen *par excellence* in pseudobulbar paralysis. On the other hand, exaggerated emotional display may appear in the course of diseases in which bilateral 'voluntary' control is not in any way, or not seemingly, impaired by the morbid state. In this case, as, indeed, in normal persons, "the emotional stimuli evidently overwhelm the control mechanism, and we must suppose either an irresistible quality in them, heightened by disease, or a constitutional peculiarity on the part of the individual—disease apart, or defect of cortical control not discoverable in tests for volitional facial innervation, or, perhaps,

defect on the afferent side to the cortical emotional 'centres' from which the faciorespiratory paths arise."

These considerations undoubtedly apply to disseminated sclerosis, for while we have found no apparent 'voluntary' facial weakness in our patients, no less than 97 per cent. of them remark that their control over emotional expression is lost or imperfect. Constitutional peculiarities can be excluded, in view of the number of cases investigated, and there remains the possibility either of heightening of the effect of ordinary emotional stimuli as the result of central disease, or of disorder of cortical control for the same reason. We know that the afferent paths from various peripheral organs (eye, skin, etc.) lead through the optic thalamus, and that the affective stimulus in any given instance must be cortically appreciated. According to the hypothesis advanced in the paper above referred to, the outward expression of emotion takes place via descending paths from the cortex (not the pyramidal cortex) which skirt the lower mesial margin of the thalamus on their way to pontine and bulbar motor centres. It is stated in the same place that "on the afferent side neuronal systems are relayed in the thalamus, but it is not certain if the same obtains on the efferent side, hence the possibility of a 'short-circuit' from sensory to motor path in that ganglion itself remains undecided. . . ." It is conceivable, therefore, as some have maintained, that failure of corticothalamic inhibition is responsible for undue 'liveliness' of the thalamus and for the exhibition of involuntary emotional exaggeration."

So far, then, since much uncertainty prevails, the most that can be said is, that affective expression may be facilitated and exaggerated because afferent stimuli are qualitatively altered (heightened) in consequence of thalamic dysfunction, or because cortical control over this expression (which, as stated above, is mediated *ex hypothesi* via efferent non-pyramidal corticofugal paths that pass by the thalamus on their way to lower motor centres), is disturbed, or, conceivably, because direct corticothalamic inhibition is at fault, allowing a 'short-circuit' from afferent to efferent side at that thalamic level. We are not prepared at present to advocate one view specifically in opposition to the others; we are, however, impressed by the fact that it seems difficult to exclude thalamic participation from any of them.

We next direct particular attention to the importance of realising that it is the palæothalamus which occupies that portion of the whole ganglion that borders on the third ventricle and is covered by ventricular ependyma. Now, according to Tilney and Riley¹², the palæothalamus "seems to be invested with a functional responsibility related to the development of the emotions and the emotive expressions." If, then, this part of the organ were physiologically released, or heightened in activity, or its cortical associations impaired, or if afferent stimuli to the cortex were such as to modify the corresponding efferent return via the palæothalamus to pontobulbar centres, then the exteriorisation of emotion might be clearly exaggerated.

Developing this hypothesis further, our next concern is with the pathology

of the disease. It is a most significant fact, in our opinion, that periventricular sclerosis is an almost constant finding in the affection. For example, Dawson,¹³ whose pathological work on disseminated sclerosis sets the standard, examined nine cases completely, finding periventricular sclerosis marked in six, less marked in two, and of negligible degree in only one. Similar results have been recorded by Lhermitte.¹⁴ Only one conclusion is possible, that the ventricular ependyma and subependymal tissues are invaded either by morbid agents in a toxic cerebrospinal fluid, or via terminal arterioles reaching to the same structures from the central arterial systems of the brain. While Dawson, as may be gathered from his monograph, rather favours the latter, we are of the opinion that the balance of evidence pleads in favour of the former. In any case, when we remember clinically how frequently emotional overaction is an early sign and how constantly it reveals itself in the course of the disease whatever the precise neurological type, we are inclined to entertain the theory that this particularly common, early, and pronounced clinical symptom is somehow associated with dysfunction of the palæothalamus and that this, in its turn, is to be attributed to early invasion of that structure or of its associational tracts by the postulated virus of the disease acting via the ventricular ependyma.

The more closely this hypothesis is examined the more clearly, we believe, will it be seen to furnish a possible explanation of the known clinical affective data of this peculiar, if not indeed unique, nervous disease.

(2) *Eutonia Sclerotica*.—We are on more debateable ground when we seek a possible explanation, in terms of neural mechanism, for that sense of physical wellbeing which is characteristic of the great majority of the cases in the present series of one hundred.

The feeling of physical eutonia in the normal individual must be the outcome of the totality of afferent impressions from somatic and visceral receptors. It has been described as a massive, diffuse sensory experience, a 'vital feeling,' a 'feeling of bodily life'; one of its pleasant forms is the reaction of a healthy body after physical exercise, or the 'braced' feeling attributed to a sojourn in invigorating air. Numerous everyday expressions are in vogue to indicate its reality; conversely, in its unpleasant form it is spoken of familiarly as being a feeling that one is 'out of sorts,' 'run down,' 'slack,' etc. For this vital feeling the term *coenaesthesia* is sometimes employed; the German expression is *Gemeingefühl*. We do not know that the individual waves of this sea of feeling can be differentiated; besides, it is for our present purpose immaterial to attempt any analysis of organic sensation except in so far as it has a bearing on the problem before us. We do not require to examine whether some of our organic 'feelings' are nothing more than 'sensations,' or whether in them the affective element can be distinguished from what may be called the presentational element. Suffice it to say that bodily 'feeling' is probably based largely on organic 'sensations' and that its reality, in respect of intensity, variability, and capacity for impressing itself on consciousness, is a matter of common experience.

Still speaking physiologically, we know that viscerosensory and somatic sensory impressions pass to the optic thalamus by the fillet or otherwise, and it is again immaterial for the nonce whether all or some of these are appreciated in consciousness without their extending beyond that ganglion. At what stage or in what fashion organic 'sensations' become united with, or blended into, a general pleasant (or unpleasant) 'feeling-tone' is not determined, but scarcely concerns the present argument. It can, however, be maintained with some show of credibility that one of the levels at which abnormalities of the sense of physical bienaise or malaise may arise is the thalamic level.

Now if a patient suffering from disseminated sclerosis experiences so pronounced a feeling of physical wellbeing as is patently out of harmony with his neurological condition, a twofold explanation is possible; either the sum of afferent impressions streaming to the thalamus is quantitatively or qualitatively altered, or, being more or less normal, is misinterpreted in consciousness (cortically or thalamically, so to say) as a consequence of a diseased condition at one or other of these two neural stations. From the viewpoint of neuropathology, the cortex is not one of the common sites for structural invasion in the case of the disease under discussion, although, as is known, it is on occasion implicated; its involvement is never so regular a feature as is the widespread periventricular process already made the subject of allusion. In all probability, therefore, seeing that eutonia sclerotica characterises no less than 84 per cent. of all cases, we are justified in assuming that its appearance is causally linked to disorder of function of the thalamus. Since careful examination of all our cases from this special standpoint has failed to reveal any obvious visceral, or, for that matter, neuroglandular dysfunction, we see no reason to suppose that afferent impressions reaching the thalamus have undergone any change in respect of either quantity or quality; that is to say, we have found no constant alteration of bodily function with which alteration of afferents might be correlated. We are accordingly driven to the conclusion that, if the explanation of the occurrence of normal bodily feeling outlined above is acceptable, its apparent undue intensity or exaggeration in many cases, constituting an incongruous eutonia or bienaise, must be the result of misinterpretation of incoming impressions at, and from, the level of the optic thalamus. To attribute this defect of appreciation to a dynamic change in thalamic function, the sequel to local toxic action, is no doubt a vague way of speaking; but we have tried to indicate the steps which lead us to offer this suggested explanation and, after all, we have to seek a plausible theory for the occurrence of a symptom which is as definite as nystagmus or an extensor response, and even more frequent.

(3) *Emotional Content; Euphoria and Dysphoria Sclerotica.*—The problem set us becomes no easier when we approach the question of a possible explanation of the prevailing mood of disseminated patients in terms of neural mechanism. Indeed, in the present state of knowledge any such effort at correlation may be purely illusory.

It cannot be denied that bodily states may, and often do, conduce to the development of an emotional mood, as when irritability or bad temper is the outcome of dyspepsia, or hilarity the sequel to alcoholic imbibition. A distinction should be drawn, in this connection, between a temporary or transient emotional mood and a prevailing emotional disposition. Now in the great majority of the cases of this series we have been struck in the course of examination with the fact that it is precisely the latter which has become modified in association with the development of the disease ; again and again our patients have assured us of the existence of a prevailing, persisting, continuous disposition to cheerfulness, say, or, in a minority, to low-spiritedness and depression. Whatever comes along, real or imaginary, is coloured by this persisting emotional disposition ; if the patient is happy, he turns every trifle into a cause of further happiness ; if miserable, everything makes him more so. On the other hand, pronounced fluctuations of mood certainly characterise a percentage of our cases, and these are not to be ignored in discussion.

For reasons already given, change in, or intensification of previously existing, emotional disposition cannot be assigned to any recognisable factor other than the disease itself, but since to assign affective disposition a locus in the nervous system is a precarious proceeding in states of health, we have no data to rely on if we wish to associate changes in it with changes following on invasion of that system by a virus capable of toxic action on neuron groups. Dr. C. K. Mills once declared he is not one of those who believe that the problem of emotion, or of any other great mental process, is to be explained by regarding it in some vague way as a complex expression of the action of the cerebral cortex as a whole, a declaration with which we are in complete agreement. At the same time, the study of the emotions has not advanced far enough to enable any conclusions to be drawn, for our present purpose, that are other than purely hypothetical.

Comment has already been made on the resemblance which not a few of our cases have exhibited, in respect of prevailing emotional mood, to certain mild states of narcosis or of alcoholism. It is as though the patients see everything of roseate hue ; all unpleasantness is excluded ; as "all seems yellow to the jaundiced eye," so to many patients of the euphoric type serenity and tranquillity are on every hand. Leaving the language of metaphor, we say that the influence of a toxic or toxi-infective disease is in many instances to produce a persisting emotional disposition which is radically the opposite of what previously obtained (as numerous cases testify) ; and it is at least conceivable that in part this is the outcome of an alteration in feeling-tone which itself is based on misinterpretation of physical stimuli. It cannot be a mere coincidence that change in prevailing mood is as regularly to be expected in the average case of the disease as are those other affective symptoms for which we have attempted to demonstrate a possible association with disorder of thalamic function of toxic or toxi-structural origin.

This problem of possible localisation for emotional mood, however, may be considered from another angle. The fact that only two out of 100 consecutive cases exhibit intellectual deterioration, while 100 per cent. show definite change in emotional disposition, is very impressive. No other deduction is permissible than that in the average case the toxin affects the emotional function of the brain while it does not affect the intellectual function. With this clinical generalisation we place the pathological generalisation that the ventricular system is invaded, and certain basal areas thereby, very much more than the cortical superficies. We believe, further, in the law of the specific energy of the nerve cell, as of all somatic cells; that is to say, nerve-cells subserving intellectual function cannot have another function in addition, e.g., any connected with the emotional sphere. Interesting developments in this respect have recently been made by Thalbitzer,¹⁵ who says: "We must therefore consider it as definitely settled that feeling is not a by-product of brain-cells which have another function, but that if we recognise feeling to be an elementary psychic function we must also acknowledge that it proceeds from its own cells which are collected in a 'feeling-centre.'" We are of the opinion that the clinical data collected in this paper substantiate the conclusions of Thalbitzer, based largely on his psychiatric studies; and further, we wish to point out that in this connexion the phenomena of the disease may be usefully contrasted with those of certain psychotic states, in which definite dulling or even loss of the emotional side of the patient's life occurs with relatively normal intellectual conservation.

In fact, though we are not prepared to pursue this line of argument further at the present time, it may well turn out that the clinical data of disseminated sclerosis, as far as the affective sphere is concerned, will throw a light on the pathogenesis of the emotional phenomena of various psychoses and psychoneuroses, in which that sphere is definitely disordered. Since such changes can be assigned, in this disease, to neurological and not psychological determinants, it is legitimate to suggest that the analogy is applicable to other diseased conditions not usually allowed, or not as yet shown, to have a neural basis. We have been impressed many times by the striking, if fleeting, similarity between some of the mental phenomena in our cases and those of other well-known, psychiatric, symptom-groups. Collaborative study in this respect by the neurologist and the psychiatrist may elicit valuable information.

CONCLUSIONS.

1. One hundred consecutive cases of disseminated sclerosis of both sexes, of great variability as regards duration, degree, and clinical type, have been submitted to a complete neurological and psychological investigation.
2. The vast majority of these cases have shown changes in (a) prevailing emotional disposition, (b) emotional expression and control, (c) sense of physical wellbeing.
3. These affective symptoms are characteristic of the disease, are primary

or direct results of the disease-processes, and are completely independent of duration, degree, or clinical type.

4. They are far more frequent than any single symptom of the neurological series, and constitute a diagnostic triad of greater value than any neurological symptom-complex.

5. In a fair number of instances they precede the appearance of any somatic neurological symptom, subjective or objective.

6. The common feeling of emotional or affective wellbeing may be designated euphoria sclerotica, and that of physical wellbeing eutonia sclerotica. The undue optimism exhibited by a majority of patients may be called spes sclerotica.

7. In comparison with these affective symptoms, intellectual disorders are minimal and negligible.

8. We associate the invasion of the affective sphere with the known pathological fact that the disease almost constantly shows a periventricular, subependymal spread, and the relative integrity of the intellectual faculties with the relative conservation of the cortex, unless, indeed, the disease is far advanced.

9. Evidence is adduced which suggests that the affective symptoms are the outcome of invasion of the palæothalamus by the morbid process.

10. The affective symptoms may arise before structural disease of the neuraxis is clinically apparent, and can be set down to dynamic alteration of function of toxic origin.

11. By analogy, it may be that certain psychoses and psychoneuroses characterised by changes in the affective field have a toxic or toxi-structural and not a psychopathological basis.

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