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Part I.—Original Articles.

Amentia and Dementia: a Clinico-Pathological Study.

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SPECIAL VARIETIES OF DEMENTIA.

(B) *Dementia following Epilepsy.*

THE present group contains 20 cases of "Dementia following Epilepsy," of which 12 are of the male and 8 are of the female sex.

As has already been indicated both in the introduction to this section (*Journal of Mental Science*, 1908, pp. 267–8), and also in the section on "Epileptic Insanity" (*ibid.*, 1906, pp. 5–14), epilepsy occurs most frequently in association with mental disease in those types of the latter in which cerebral degeneracy is most marked. This remark is illustrated by the following table, which shows the percentage of epilepsy in certain divisions of the 728 cases under consideration :

	Number of cases.	Percentage of epilepsy.
Low-grade amentia (idiocy and imbecility)	94	37·2
High-grade amentia	189	12·7
Dementia	445	4·5
Total	728	10·9

The writer regards both epilepsy and amentia as degeneracies, and considers the general effect of coexisting epilepsy to be harmful in all types of the latter. The epileptic idiot or imbecile is more spiteful and degraded, the epileptic high-grade ament is more vicious and impulsive, the epileptic

maniac is more treacherous and dangerous, and the epileptic dement becomes progressively more demented, than occurs in the cases of the corresponding types of mental disease when this complicating factor is absent.

The writer has produced evidence in this paper that epilepsy may occur in association with *any grade* and even with *any type* of amentia. Though for convenience cases of amentia associated with epilepsy have been grouped separately under low-grade amentia (*ibid.*, 1905, pp. 515–523), and as a special group of "epileptic insanity," it would have been possible to have scattered them throughout the various types of amentia which have been described. Certain cases of insanity with epilepsy might be included in the group of "excited and 'moral' cases," large numbers of cases of insanity with epilepsy are "recurrent," the alternation of typical hysterical attacks with true epileptic fits has been referred to under "high-grade amentia with epileptic mania," and, finally, certain cases which, in the absence of fits, would be classed under "paranoia," are illustrated by Case 237 under "higher grade amentia with epileptic mania." The coexistence of epilepsy and mental disease, however, so profoundly influences the course of the latter, and so modifies its symptomatology in the case of the higher grades of amentia, as to necessitate the inclusion of "epileptic insanity" as one of the types of amentia, unless as an alternative "amentia with epilepsy" and "amentia without epilepsy" were considered quite separately. This, though a possible, is not a desirable clinical classification, because the majority of the examples of the higher grades of amentia, when associated with epilepsy, exhibit a sufficiently characteristic symptomatology to enable them to be classed under the term "epileptic insanity."

The facts above cited may, in other words, be regarded rather as evidence of the unity of mental disease than as indicating the desirability of regarding amentia with epilepsy and amentia without epilepsy as separate divisions of a general group of amentia.

A similar line of argument may be applied to the subject of dementia. The writer is of the opinion that dementia following epilepsy is not a consequence of epilepsy *per se*, but that it occurs in such epileptics as possess higher cortical neurones of deficient durability. Owing to the existence of certain general

and local extra-neuronic but intra-encephalic morbid states, which result in the development of a *progressive* dementia, in some cases closely resembling that of dementia paralytica, examples of dementia following epilepsy form a fairly definite clinico-pathological group. As in the case of "amentia with epilepsy," so in that of "dementia following epilepsy," the epilepsy, however, merely accentuates the mental state and does not evolve anything new. The majority of the cases of "dementia following epilepsy" are examples of "primarily neuronic dementia" of the "senile," "presenile," "mature" or "premature" forms, in which epilepsy is a concurrent phenomenon. A few are examples of "progressive and secondary dementia" of either the senile or the paralytic form. In the case of the latter of these, owing to its syphilitic ætiology and consequent individual course, the epileptic cases are included (in the intention of the writer though not in fact, as the small number of cases of dementia paralytica does not happen to contain an example of the epileptic form), as are all the other (and non-epileptic) types from the imbecile to the "normal." In the case of the former of these, on the other hand, this course has not been adopted, since there is nothing especially characteristic in progressive senile dementia beyond the inevitably progressive nature of this type, and the senility of the cerebra and of the cortical arteries of the sufferers. Cases of "Dementia following Epilepsy" are thus conveniently grouped together under a special heading.

Few remarks are needed with regard to the cases included in this group.

The 12 cases of the male sex commenced at the respective ages of *12*, 15, *16*, 17, *18*, *25*, *27*, 28, 31, *32–*, 38, and 39–. The first of these was an imbecile (slight low-grade amentia), and the others in italics were high-grade aments. Of the 12 cases, 9 were single and 3 were married, the latter being those commencing at the ages of 18, 27, and 28 respectively.

The 8 cases of the female sex commenced at the respective ages of *14*, *24*, *24*, *31–*, 31, *42*, 46 and 48. Those in italics were high-grade aments. Of the 8 cases 6 were single and 2 were married, the latter being those commencing at the ages of 31 and 48 respectively.

With regard to the symptomatology of "Dementia following Epilepsy," the writer has again and again been impressed by

the difficulty of distinguishing between cases of ordinary primarily neuronic dementia and cases of epileptic dementia, in the absence of a history of epilepsy. This remark especially applies to cases of premature dementia, as the majority of examples of epileptic dementia occur before maturity. The chief distinguishing feature, when a series of cases is analysed, is the profound grade of the dementia which occurs in cases suffering from epilepsy. Such cases, in fact, had they not suffered from epilepsy, would probably have become ordinary examples of primarily neuronic dementia. Under the influence of epilepsy, however, the dementia, instead of remaining stationary when at the most it has advanced to the moderate stage, progresses until it becomes gross. Whilst alcoholic cases frequently exhibit a well-marked degree of dementia with extreme mental hebetude and great loss of memory, they differ from cases of epileptic dementia in being, as a rule, useful mechanical workers, who suffer from a more or less general maiming of the cerebrum, instead of an extensive dissolution of the centre of higher association with less marked affection of the regions concerned with the processes of lower association.

As a rough criterion of the severity of the grade of dementia which exists in epileptic cases which have developed dementia, it may be remarked that of the 12 males, 9 were unable to work, 2 were ordinary workers, and 1 could do a little work; and that the whole of the 8 females were incapable of employment.

The following table, which for convenience is inserted here, very roughly but graphically illustrates the relative severity of the grade of dementia in the several types of cerebral dissolution described in this part of the paper:

Type.	Workers.	Refuse to work.	Unable to work.	Total.
Primarily neuronic dementia:				
Premature	64	15	33	112
Mature	42	11	7	60
Presenile	35	13	17	65
Senile	57	10	56	123
Progressive and secondary dementia:				
Dementia senilis	4	—	20	24
Dementia Paralytica	10	4	9	23
Dementia following sense deprivation	3	—	7	10
Dementia following epilepsy	3	—	17	20
Dementia following cerebral lesions	2	—	6	8

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It will be noted that the proportion of non-workers is about the same in the groups of progressive senile dementia and of dementia following epilepsy.

The following ten cases of "Dementia following Epilepsy" are inserted as illustrative examples of the group under consideration :—

Imbecility with Epilepsy; Premature Dementia; Male, æt. 22; duration of retrogressive symptoms ten years.

CASE 701.—A. T—, male, single, of no occupation, æt. 22. Certified two years. An illegitimate child. Epileptic since the age of two years, and showed mental symptoms at the age of twelve years. Notes taken four days after admission.

A very dull and phlegmatic man who appears to be about sixteen or seventeen years of age. When the attendant is asked if the patient has had any fits the latter replies: "I ain't got nothing in here," and smiles fatuously, adding, "No more fits, never take them things." He gives his name and states that his age is twenty-one. When asked to write his name he does this in the slow and careful manner referred to in the section on "Premature Dementia," and also writes the surname first and then the christian name afterwards on the next line. When asked whether he has been to school he replies, "Got put in H— Asylum and had to do school along with 'em." He says that he has done nothing since he left school. When he is then asked about his fits he says, "I don't take 'em now," and adds, "I took fits for years; none for eight years; had 'em right on my life till then." He remarks that his mother wanted to kill him, but didn't dare to do it, and that his father also wanted to kill him with a poker. "I didn't want that thing; he ain't what I call a father; he's only a step-father to me." He does not know where he is. He came "when them men come; last week I think." He states that the day is "Thursday or else Friday" (Monday). He was at his previous asylum four or five months, "That's all I was down there" (nearly two years).

Whilst under observation the patient was unable to occupy himself, but was clean in his habits.

High-grade Amentia with Epilepsy; Premature Dementia; Male, æt. 27; duration ten years.

CASE 703.—C. J—, male, single, of no occupation, æt. 27. Certified ten years, and showed symptoms for some months previously. Notes taken four days after admission.

A dull-looking man, with a narrow peaked forehead and a rough skin. Convergent strabismus. He has a habit of performing washing movements with his hands as he sits. He gives his name in a slow drawl, and when asked his age replies, "I ain't sure of the age." He writes his name in the slow and careful manner already referred to as characteristic of premature dementia. He knows neither where he is

nor where he has come from. He apparently has no recollection of the name of the asylum from which he has been transferred: at any rate, he states that he has not heard the name before when it is repeated to him. He knows neither the day nor the date. When asked about fits he replies, "I hev had 'em," and states that he does not know when.

He feeds himself, and can partly dress himself. He knows the way to the lavatory, and at times walks about the ward. He is entirely unemployed. He is occasionally shaky on his legs.

Whilst under observation this patient remained quite unchanged.

Epilepsy; Premature Dementia; Male, æt. 24; duration seven years.

CASE 704.—A. E—, male, single, of no occupation, æt. 24. Certified some months. He first showed symptoms at the age of seventeen, about which age his fits began. Notes taken five days after admission.

A dull man of childish appearance. Several old scars on the forehead. Pupils large and react normally. Left slightly larger than right. He gives his name, adding a second Christian name, and states that his age is twenty-four on his next birthday. When asked when he came here he replies, "We all came together between a week and a fortnight." He, however, knows the present day and the day on which he came. He calculates the interval from Thursday to Tuesday to be seven days. When asked about his fits he indicates that they are mild, as follows: "There's nothing to say of 'em, if I was to have one." He states that he was only a fortnight at his previous asylum. He says that before he went there he hawked fruit, but has no idea when that was. He says that he intends to continue this occupation when he leaves this asylum. He went to school when he was "a little nipper," and got into the "highest standard." He says (incorrectly) that he can read and write well. His attempts at arithmetic are as follows: $12\times11=24$, $7\times9=64$, $8\times5=40$, $7\times6=42$, $12\times11=64$, $5\times9=64$, $8\times11=56$, $4\times3=12$, $9\times2=24$, $4\times2=8$. It is, therefore, quite clear that he has at one time learned, but has forgotten, the multiplication table. He says that he did no work at his previous asylum, but he thinks that "If I were asked to do it I should hev to do it, I dare say."

Whilst under observation this patient looked after himself. He never did, or attempted to do, any work. He occasionally used to pick up a newspaper, but did not seem to be at all interested in its contents.

High-grade Amentia with Epilepsy; (? Presenile) Dementia; Male, æt. 45; certified seven years; showed symptoms for twenty-seven years.

CASE 705.—W. E—, male, married, farm hand, æt. 45. Certified 7 years, but had shown symptoms since the age of eighteen. Mother insane, and maternal aunt deaf and dumb and "silly." Notes taken four days after admission.

A man of anthropoid appearance. Ears simple, pear-shaped, and without lobules. Smile happy and fatuous. He at once begins to talk in a practically incoherent manner. Name? "Yes, E—; I be the youngest one." Age? "Yes, I bin middling hearty, I ain't bin ailing like." AGE? "Pretty nigh 40." Married? "Yes, been married, wife's dead and gone, and young uns, too; I think more on 'em so I ain't troubled myself about 'em." He has had fits for several years, but "not for two years I don't think I have." What day is it? "I used to take a little physic, I did, just to keep a cold wave on me." Age? "I was born in five and twenty in February." Where are you? "At R. B—" (name unknown). Have you ever heard of H—? (the asylum from which he has come) "No I've never touched her, some says she's been about here, but I ain't seen her and I don't know her."

This patient remained unchanged whilst under observation. He was dull and quiet and uninterested in his surroundings. He at first required coaxing even to dress himself and made no attempt to employ himself, but later on became a worker of average type.

Epilepsy; Dementia; Male, æt. 66; certified twenty-seven years.

CASE 707.—A. G—, male, married, occupation unknown, æt 66. Certified thirty-nine years. Notes taken four days after admission.

A dull, heavy and depressed-looking man. His forehead is covered with vertical and horizontal wrinkes. He appears to take no interest in his surroundings, and sits down without looking at me. Whilst being examined he incessantly turns his hat round and round. He gives his name as "J. W—, from L—" (both these names are unknown). His age is "very near 60." Where are you? "Three corners off Old Road" (name unknown). When the name of the asylum from which he has come is mentioned to him he does not recognise it, and adds "I heard some talk of such a party . . . and three more besides." What time of year is it? "12 o'clock" (3 p.m.) He says that he has not yet had his dinner to-day. He recognises one of the attendants as the man who "keeps the stores." When he is asked who another is he replies, "B—r if I do."

As a rule the patient looks stolidly forwards or downwards, but at times he looks up in a dull and sleepy way. Whilst he is apparently deeply absorbed he at once looks up if he is gently touched on the hand. He replies fairly readily to questions, and, as has been indicated above, he has a habit, when he is doing such a thing as putting on his trousers, hat, etc., of passing the article from hand to hand, from the left to the right round the front, before he puts it on. He feeds himself. He never makes a move to the lavatory.

Whilst under observation he remained quite unchanged.

High-grade Amentia with Epilepsy; Premature Dementia; Female, æt. 24; certified seven years, and previously at the age of fourteen years.

CASE 713.—F. C,— female, single, of no occupation, æt. 24; certi-

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fied seven years, and previously at the age of fourteen years. Notes taken on the day after admission.

A dull, vacuous girl, with an open mouth and a vacant expression. Pupils dilated. Palate very high and V-shaped. Ears lobuleless. She gives her name and states that her age was twenty-two years last December. She speaks with a certain amount of hesitation. She does not know when she came to this asylum. She recognises the name of her previous asylum when it is repeated to her, and says that they have a home built there, that she has come from it, and that she was there "a good long time now." She informs me that previously she lived with her "gwanmother." She does not know when she began to have fits. "It makes my head so funny. I couldn't hardly tell you." When she is going to have a fit her "bosoms hurt me and my head goes." She here makes jerky movements with her hands over her forehead, and adds, "Makes my head so funny that I don't know where I am the same day I have 'em." . . . "My head is funny for two or three days afterwards." Patient is very childish and simple, very dull and listless, and quite unable to employ herself, although she can dress herself with assistance.

Whilst under observation this patient remained unchanged.

High-grade Amentia with Epilepsy; Premature Dementia; Female, æt. 27 years; duration three years.

CASE 715.—M. W—, female, single, of no occupation, æt. 27. Was previously in an asylum at the age of twenty-four years, and the present is a continuation of that attack. Notes taken two days after admission.

Patient is a dull-looking girl, who at first resisted when she was brought forward for her case to be taken. She gives her name, but does not know her age. She knows that she has been here two days. She writes her name slowly, painfully, and carefully. Her attempts at arithmetic are as follow: $2 \times 2 = 3$, $4 \times 2 = 8$, $5 \times 3 = 9$, $6 \times 2 = ?$ She spells cat "tac." She cannot spell "horse," and she says that she does not know what a horse is. She spells "cow" and "man" correctly. During this examination she stands up as if saying a lesson. Her articulation is normal, and the above replies, as does her handwriting, present the various indications which have already been described as characteristic of ordinary premature dementia. She is dull and slow and appears to know nothing about anything when she is questioned. When I have done with her she walks off and imagines that she is going home.

After five months her condition was as follows: She is on the whole quiet, and she is entirely unemployed. She dresses herself somehow and washes herself, and then requires to have her hair done for her. For from ten to thirty minutes before a fit she is excited, violent, and impulsive, strikes the nurses, and throws the furniture about. After a fit she is for at least twenty-four hours very dull, drowsy, and confused. She thinks that people deprive her of her food. She sometimes stands or wanders about the whole day, but takes no notice of anyone. When asked to do anything, *e.g.*, to play the piano, she says, "No, I'm

not going to; I don't want to," but soon afterwards will get up and do it. She never either reads or writes. She is invariably clean in her habits.

Whilst under observation this patient remained unchanged.

High-grade Amentia with Epilepsy; Dementia; Female, æt. 32; certified one year and previously in an asylum.

CASE 716.—E. F—, female, single, of no occupation, æt. 32. Certified one year and had previously been in an asylum. Notes taken on the day after admission.

A vacant-looking girl with a pale face and staring eyes; pupils mobile: palate narrow and very high; ears lobuleless. She gives her name "same as you've got written there," pointing to my book. Age? "I don't justly know how old I am, but I had a birthday on October 3rd." She knows the day and has been living here "some time now." She went to H— (her previous asylum) in a fly yesterday when the fly went there, and she was in the train yesterday. She thinks that she went to H— (her previous asylum) yesterday, "same as the rest of 'em did." She thinks that the month is September (October), and repeats that her birthday will be on October 3rd. She came here because she had fits. She suffered from them for some time before coming here. "I never hardly knows when I have 'em. I'm taken so suddenly and knocked down on the floor." After a fit "I feel all right." After her examination was concluded and she was going away she suddenly fell down on the floor exactly like a case of hysteria.

Whilst under observation this patient was dull, listless, and unoccupied. She did very little for herself and took little or no interest in her surrounding.

High-grade Amentia with Epilepsy; (? Premature) Dementia; Female, æt. 43; certified one year.

CASE 718.—L. G—, female, of no occupation, æt. 43. Certified one year. Notes taken on the day after admission.

A dull, apathetic, and sleepy-looking woman. The angles of her mouth droop, and her hands are narrow and atrophous, and show signs of prolonged disuse. She is very dull and slow in speech and movement, and pays little attention to questions. She gives her name and states that her age is 38 years. She, after repeated requests, slowly and laboriously writes her name as an almost unintelligible scrawl. When she reaches the edge of the paper she endeavours to squeeze in the last three letters, and, failing to do this, leaves out the last two. She is very slow at imitating simple movements, and especially so when both hands are needed. When her limbs are thus placed in some position they often remain so for as long as a minute before she slowly allows them to fall to her lap. Were it not known that the patient frequently suffers from epileptic fits—for example, she had five during the night following her admission—the case would, without hesitation, be diagnosed as one of long-standing premature dementia with motor symptoms (catatonic form).

Whilst under observation the patient remained dull and apathetic, uninterested in her surroundings, and quite unoccupied. She was unable to do anything for herself and was defective in her habits.

Epileptic Mania; Progressive Presenile Dementia; Female, æt. 54; *certified six years.*

CASE 720.—E. V—, female, married, housewife, æt. 54. Certified six years. Mother suffered from fits. Notes taken two days after admission.

A garrulous woman with a very scarred face. She gives her name, and states that her age is fifty-two years. She has come from "Worth Rectory. That was my home and I've always found it so." She points out one of the patients and says that she is her niece. She then informs me that Queen Alexandra has four or five daughters here, and that the nurse is her sister-in-law and Mr. J. N—'s wife. She does not know me, but asks if I took lodgings at her place when she first came away. She knows the day, and says that she could soon tell me the date if she had an almanac. She owns "this whole place. My brothers have bought the ground in front of my house here and your brother took the butcher's shop on the schools." She then begins to tell me about her family. When asked about fits she tells me that she has had two in about twenty years. She has been married sixteen or eighteen years, and has had twelve or fifteen children. "They came by anyhows. I once had three and my sister that is Queen Alexandra now helped me through with 'em, but they all died as soon as they were born. Mr. B— (name unknown) didn't like to see 'em lying about, and he used to make boxes and bury 'em. They were only tiny children and lived only ten hours, and I had three alive working under the Queen at R— Church, my own daughter, a nephew of mine, and my own son." Ten years ago she had her tongue taken out and cut off and splintered, and her husband, her brother, and herself have all been mutilated.

Five months after admission the following notes were taken: She looks a dull, miserable object. She says that she has been murdered by inches and inches for 127 years and worse for 119 years. She has a clock to prove it, the clock of her grandmother, which stood for over 1,000 years in a church. The ward clock is a church clock, and no one can claim it but herself. To-day is "Tuesday, hot-cross-bun day" (Monday, February 1st). "I will give you a clean apron on Valentine's day. I am not saucy, and give no one sauce," etc. She is very abusive, and at times uses foul language. She is violent and impulsive and a "terror." Nearly every day she swears about her food, and if she cannot at once get what she wants she throws the plates, chairs, etc., about. She is not destructive, but she is untidy in her appearance and cannot dress herself properly She never does any work. She sometimes asks for a prayer-book and then swears at it. She has very severe fits, and for two or three hours after them she is confused and violent.

Whilst under observation this patient visibly deteriorated in her mental condition, though she remained as violent and impulsive as before.

(c) *Dementia following Cerebral Lesions.*

The present and final group contains eight cases of cerebral lesion of various kinds. They are as follows :—

	M.	F.	T.
(1) Cerebral syphilis - . . .	2	—	2
(2) Other lesions (gross) :			
(*a*) Old standing (embolism, etc.)	1	2	3
(*b*) Gross vascular degeneration .	—	3	3
Total . .	3	5	8

This group calls for no especial remark beyond the reference contained in the introduction to the section (*Journ. Ment. Sci.*, 1908, pp. 268–9).

Of the cases of cerebral syphilis, No. 721 is an example of organic dementia in a man of originally defective intelligence who was aged 42, had been certified nine years, had been previously under asylum treatment between the ages of fourteen and twenty-four, and showed evidence of congenital syphilis ; and No. 722 is an example of progressive dementia, who was aged 46, had been certified one year, and showed evidence of former syphilis, gross vascular degeneration, and paralysis of the left side of the face. The father of the latter case was insane.

Of the cases of gross lesion, the male patient (No. 723) was aged 41, had been certified four years and suffered from bilateral palsy secondary to trauma. Of the five females, No. 724 was aged 45, had been certified since the age of twenty-eight, and suffered from a right-sided palsy following childbirth; No. 725 was aged 48, had been certified one year, and also suffered from a right-sided palsy ; and Nos. 726–728 are examples of progressive dementia, with cerebral lesions following vascular degeneration, and were aged respectively 67 (certified three months), 75 (certified twenty-nine years), and 53 years (certified twenty-two years).

None of the cases contained in this group are appended, as, apart from dementia, their symptomatology is individual and accidental, and their inclusion would, therefore, serve no useful purpose.

General Review and Summary[1].

The present paper contains the final results of an investigation into the functions of the cerebrum and the physical basis of mental disease which has occupied the writer during a period of more than twelve years. The general review and summary, which follows, therefore affords him an opportunity of generally summarising the results of his researches and of indicating on the one hand in what degree they confirm and elaborate the conclusions of other workers, and on the other in what respects they differ from these.

The first paper of the series was published in the year 1900, and dealt with the exact histological localisation of the visual area of the human cortex cerebri. In this communication the cortex of the occipital region of the cerebrum was minutely investigated, and the writer histologically mapped out a definite area surrounding the calcarine fissure. This region, which he termed the "visuo-sensory area," he proved to be the visual projection sphere by a systematic micrometric examination of the whole of this and of the neighbouring cortex in normal persons, and in cases of long-standing and of congenital blindness. In the cortex surrounding the visuo-sensory area, to which he applied the term, since adopted by Campbell, Mott, etc., of "visuo-psychic," he found by the micrometric method that old-standing optic atrophy and congenital blindness caused no modification of the lamination. In this paper the writer introduced a classification of the cortical layers of the visuo-sensory area and of the visuo-psychic region (based on the existence of three primary cell and two primary fibre laminæ), which has since been largely adopted, notably by Mott and by Watson. It may further be noted that in this paper the results of the writer's later study of the mode of development of the cortical laminæ were foreshadowed in the statement, "The majority of the layers of the cortex do not vary appreciably in thickness as the result of age or chronic insanity, but there is an almost exact correspondence between the thickness of the conjoined first and second layers of the cortex (outer layer of nerve-fibres and pyramidal layer) and the degree of amentia or dementia existing in the patients." Amongst other facts which were elicited was one of primary importance with regard to the

functions of the cell-layers of the cortex, namely, that the pyramidal layer of the visuo-sensory area develops earlier than that of the visuo-psychic region, and reaches its adult depth at the age of one month: whereas in the latter region it is less than three-quarters of the adult depth at the age of one month, and but five-sixths at the age of three months.

With regard to the delimitation of the visuo-sensory area, the writer indicated that his research confirmed the opinion held by Henschen and supported by the embryological researches of Flechsig and the clinico-pathological observations of Seguin, Vialet, etc.

In introducing his classification of the cortical layers he critically examined those of Meynert (1872), Krause (1876), Betz (1881), Leonova (1893), Hammarberg (1895), Schlapp (1898), and Cajal (1900).

Since the publication of this paper, which was the first of the kind since the important research of Bevan Lewis and Henry Clarke (1878) on the cortical localisation of the motor area of the brain, whose belated recognition has followed the experimental work of Sherrington and Grünbaum, and the histological researches of Campbell and of Brodmann, many papers dealing with cortical localisation by the histological method have appeared. Of these the chief are by Brodmann (1902–1907), Campbell (1905), W. Kolmer (1901), Hermanides and Köppen (1903), Köppen and Löwenstein (1905), Elliot Smith (1904–1907), O. Vogt (1906), Mott (1907), and G. A. Watson (1907). In these papers the whole cortex in many orders of mammals has been mapped out into various histologically different regions, but, except in the case of the visuo-sensory and motor areas, experimental or histological *proof* of the function of these areas is not yet complete. Two only of these researches call for remark here, namely those of Brodmann and of Campbell. These authors have independently mapped out into histologically different areas the whole human cortex cerebri. In only two regions, however, are their maps in complete accord, namely in the motor or Betz-cell area and the visuo-sensory area. The former of these is the area mapped out by Lewis and Clarke (1878), and the latter is that mapped out by the writer (1900). The extent of the visuo-psychic region, which was described by the writer as surrounding the visuo-sensory area, but was not more closely defined owing to

its somewhat indefinite limits, is given so differently by Brodmann and by Campbell that it might appear that no advance had been made on his original description. A careful study of the maps of Brodmann and of Campbell in the light of the writer's special knowledge of the histological characters of several portions of the cortex cerebri has, however, convinced him that the more elaborately detailed map of the former of these investigators is the more correct. In support of this statement he would refer to the recent paper of Gordon Holmes on the histology of the post-central gyrus, in which the findings of Brodmann are confirmed. The writer is, however, of the opinion that whilst further histological research will undoubtedly enable certain other (projection) areas to be as precisely defined as have been those of the motor and visuo-sensory areas (even if Brodmann's findings in these respects should not be confirmed in their entirety), the differentiation of the remainder and greater portion of the grey mantle into equally precise areas will be attended with great difficulty owing to the probability that considerable differences exist in the case of different individuals. He nevertheless regards such precise differentiation as possible, and considers that light will in the future be thrown on the histo-pathology of amentia or cerebral sub-evolution by this means.

It may, therefore, be stated that the exact limits of the motor or Betz-cell area, and of the visuo-sensory area, are known beyond doubt, and that their functions have been proved by experimental or histo-pathological methods. As regards the less certainly defined visuo-psychic region, the associational, in contra-distinction to receptive, function of this region has been developmentally proved by the writer in the paper under present reference, and he here, from a different aspect, confirms the doctrine of Flechsig with regard to centres of association and of projection.

The next paper to which reference will be made was published in 1903, and dealt, by the method of micrometric measurement, with the histological basis of amentia and dementia. The first part of this research consisted in an attempt, which was successful, to determine whether any constant relationship existed between the macroscopic morbid appearances, which are well known to exist in many cases of mental disease, and the clinical types of insanity manifested

by the patients. It was shown that these morbid appearances vary in degree with the amount of dementia existing in the patients, and are otherwise independent of the duration of the disease; and the following regions of wasting of the cerebrum in dementia were determined:

(1) The greatest amount occurs in the prefrontal region (anterior two-thirds or so of the first and second frontal convolutions, including the neighbouring mesial surface, and the anterior one-third or so of the third frontal convolution).

(2) It is next most marked in the remainder of the first and second frontal convolutions. (In dementia paralytica Broca's gyrus should, as a rule, be included here, and 2 and 3 should follow 4.)

(3) It is, perhaps, next most marked in the ascending frontal and Broca's convolutions, though this, in many cases at least, should follow 4.

(4) It is next most marked in the superior and inferior parietal lobules and in the first temporal convolution.

(5) It is least marked in the remainder of the cerebrum.

With regard to cases of insanity without dementia, it was indicated that no morbid appearances were present, but that small and simply convoluted cerebra were frequent. It was further shown by micrometric measurement that in certain such brains as appeared normal on macroscopic examination the cortex was markedly deficient in depth.

The second and histological part of the paper dealt with the micrometric examination of a specially selected area lying in the centre of the chief focus of wasting (1), in fœtuses, infants, normal individuals, idiots, imbeciles, cases of chronic and recurrent insanity without dementia, and cases exhibiting various grades of dementia. The writer was able to demonstrate several facts, of which the following are the most important:

The normal prefrontal cortex.—In the three normal cases examined, not one of which is likely to be developed above the average, and any one or all of which may be below this, the general average measurements of the first case are almost the counterpart of the average of the three. The difference between the several cases exists in the pyramidal layer of cells, which of all the layers is the easiest to measure accurately, and the other layers are practically of the same depth.

The development of the prefrontal cerebral cortex.—The pre-

frontal cortex begins to laminate about the sixth month of fœtal life by the separation off of the polymorphic layer (5), and the inner line of Baillarger (4), both of which layers are very little below (three-fourths of) the normal depth almost from the first. The layer of granules (3) next develops, and at the period referred to is only about half the normal depth. At this time the pyramidal layer (2) is only one-fourth of the normal depth. At birth the pyramidal layer is still little more than half the normal depth; the granule layer (3) has now become three-fourths of the normal, and the fourth and fifth layers are as before (rather more than three-fourths of the normal depth).

The prefrontal cortex of congenital amentia.—Degrees of under-development, general and local (*i.e.*, with regard to position in convolution, not to position in cerebrum), exist, which vary inversely with the mental power of the individual concerned.

The prefrontal cortex of chronic insanity without dementia.—In these cases under-development of the pyramidal layer of nerve-cells exists, the other layers being approximately normal.

The prefrontal cortex in dementia and dementia paralytica.—Degrees of wasting exist which vary directly with the amount of dementia present. When the mental power of the patient is as that of the new-born child, all the cortical layers are approximately in the same condition as in the latter.

Amentia and dementia.—In many cases amentia undoubtedly co-exists with dementia, but as a whole the greater the amentia the less is the dementia co-existing, and *vice-versâ*, as the less highly developed the neurones the greater is their relative durability, and the less is the injury produced by the slight "stress" which is necessary to affect them, whilst, on the contrary, highly developed but deficiently durable neurones, to be subjected to a breaking strain by "stress," require it in their case to be so great that rapid degeneration results. This degeneration only becomes extreme in those cases in which severe vascular affection is present.

As a consequence of these results the writer was, therefore, enabled to formulate the following conclusions with regard to the functions of the cortical cell-layers:—

The layer of polymorphic cells (5) is the first to be differentiated during the process of lamination, and it is the last to fail in the retrogression of dementia. A decrease in this layer

exists in extreme aments (normal or otherwise), and in dements who are unable to carry on the ordinary animal functions, such as attending to their own wants, etc. *This layer, therefore, probably subserves these lower voluntary functions of the animal economy.*

The granule layer (3) is developed after the polymorphic layer. In the visuo-sensory area the optic radiations end in the midst of the hypertrophied and duplicated granule layer. *This layer, therefore, probably*, reasoning by analogy, *subserves the reception or immediate transformation of afferent impressions, whether from the sense organs or from other parts of the cerebrum.*

The pyramidal layer (2) is the last layer of the cortex cerebri to develop, and it is also the first to undergo retrogression in dementia. It is the only layer which appreciably varies in depth in normal brains; the degree of its development in normal infants and in congenital aments varies directly with the mental power of the individual, and the degree of its retrogression in demented patients varies directly with the amount of dementia existing in the patient. *This layer, therefore, subserves the "psychic" or associational functions of the cerebrum.*

The first and fourth layers of the cortex cerebri, being primarily cell-process layers, do not need further reference in this connection, although it is not denied that the relatively small number of cells which, in the adult state of the cortex especially, are contained in these layers, may and probably do possess important though minor functions in the process of cerebration. In the psycho-motor area, for example, the Betz cells, which really belong in the opinion of the writer, to the fourth layer or "inner line of Baillarger," and are therefore not "pyramidal" cells at all, constitute the origin of the important efferent tract for skilled voluntary movement. Probably the "solitary cells" of Meynert in the occipital cortex possess a somewhat analogous function, and perhaps the same may be said concerning the more or less pyramidal-shaped cells which lie in layer 4, or the "inner line of Baillarger," in other regions of the cerebrum. One is probably hardly justified in assigning a function to the few cells which lie in the first or superficial layer of the cortex cerebri, but perhaps, reasoning on general grounds, it is not unfair to suggest that they possess associational functions similar to those of the pyramidal layer above

which they lie, and with which, in order of time, they appear to be developed.

In a further communication, also published in 1903, the writer applied his results to the question of the functions of the frontal lobes. He remarked: "The anterior centre of association of Flechsig is the region concerned with attention, and the general orderly co-ordination of psychic processes; and the cellular elements throughout the cortex, which are especially concerned in the performance of associational functions, are those of the pyramidal layer of nerve cells"; and, "The pyramidal layer, therefore, subserves the 'psychic' or associational functions of the cerebrum. This is pre-eminently the case in the prefrontal region, less so in the visuo-psychic region, and least of all in the visuo-sensory region. *These three regions are, therefore, of different grades in the hierarchy of cerebral function.*"

The writer is thus in agreement with Flechsig with regard to the existence of centres of association and of centres of projection, but, as the result of his researches, he defines *three* grades in the hierarchy of cerebral function, namely: (1) centres of projection, of which the visuo-sensory area is a type; (2) regions of lower association, of which the visuo-psychic region is a type; and (3) the centre of higher association, co-ordination, and control, which is situated in the prefrontal region.

The writer thus differs from both Flechsig and Bianchi in recognising three grades of cerebral function, in place of the projection and association areas of the former, and the perceptive and conceptive centres of the latter.

He will now refer to the important paper by Watson (1907) on the mammalian cerebral cortex, which, from the phylogenetic aspect, forms the complement of the ontogenetic conclusions which the writer published in 1903 with regard to the mode of development and functions of the primary cell-laminæ of the cortex cerebri. In this paper Watson has mapped out the cortex cerebri of certain insectivores into histologically different regions, and he has confirmed the work of the writer on the order of development of the primary cell-laminæ of the cerebral cortex, and as regards the functional significance of these. Watson's conclusions, in brief, are as follows:

"The foregoing data support the following conclusions, which apply only to *mammals*, and which form, from the point of

view of the Insectivora, and of the lower mammals belonging to various other natural orders so far examined, a complement to those arrived at by Bolton, as the result of his studies of the development of the human cerebral cortical layers, and of their depth in the adult normal individual as well as in various degrees of amentia and dementia.

"(1) The infra-granular portion of the cortex (4 and 5) (omitting the constituent cells which possess motor or analogous functions) is concerned especially with the associations necessary for the performance of the instinctive activities, that is, all those which are innate and require for their fulfilment no experience or education. These form the basis of many complex actions necessary for the preservation of the individual and the species, such as the seeking appropriate shelter and protection, the hunting for food—each after his own kind—and the quest of the opposite sex. . . .

"(2) The supra-granular (pyramidal) layer—which is, relatively to the infra-granular cortex, so poorly developed at birth—is slow in reaching maturity, and is, even at its best, in certain lower mammals, such as the Insectivora, only of an insignificant absolute depth, subserves the higher associations, the capacity for which is shown by the educability of the animal. It has, therefore, to do with all those activities which it is obvious that the animal has acquired (or perfected) by individual experience, and with all the possible modifications of behaviour which may arise in relation to some novel situation, hence with what is usually described as indicating intelligence as apart from instinctive acts, the former being not merely accompanied but controlled by consciousness (Lloyd Morgan).

"In practical animal behaviour the two sets of processes are probably more or less constantly interwoven, the higher activities (supra-granular layer) coming to the aid of the lower as far as the capability of the animal allows. In the case of the lower mammals (*e.g.*, Insectivora), the limits of this capability are comparatively soon reached, and correspondingly these mammals possess a relatively poor supra-granular layer. . . .

"The infra-granular layers thus constitute the earlier developed and more fundamental associational system of the cerebral cortex; the supra-granular layer, a higher and accessory system super-added, and of any considerable functional importance only in certain regions in lower mammals, such as the Insectivora."

The writer will now generally review his present paper, which, whilst it summarises, and in places provides further data with regard to, his previous researches, is mainly devoted to the application of these to the subject of mental disease.

The paper consists of three parts, of which the first (April, 1905) is devoted to the verification and amplification of his conclusions with regard to the correlation of the various clinical types of mental disease with the morbid appearances found in such cases after death. For this purpose the earlier 200 cases have been increased to 433 with substantially identical results.

As the result of his clinico-pathological and histological studies the writer enunciated a provisional classification of mental diseases, in which he used the term *amentia* to, in the widest sense, connote *the mental condition of patients suffering from deficient neuronic development*, and the term *dementia* to similarly connote *the mental condition of patients who suffer from a permanent psychic disability due to neuronic degeneration following insufficient durability*.

The term *amentia* as thus defined covers a much larger group than that indicated by the terms *idiocy* and *imbecility*, and includes all cases possessing a general or special developmental deficiency which may become evident either with the dawn of psychic life, or at such critical periods as early childhood and school-life, puberty, adolescence, marriage, maturity, childbirth, the climacteric, etc., at any one of which the degenerate may fail to respond normally to his environment and may show his or her inherited deficiency.

The class may be grossly divided into two subdivisions, namely *low-grade aments*, or idiots and imbeciles, and *high-grade aments*, in whom the developmental deficiency becomes evident at or after puberty. In the case of the latter group, apparently complete recovery of a permanent or a temporary nature may occur, a stationary condition of insanity without appreciable dementia may follow, or at once or later a varying degree of dementia may ensue. These patients usually show more or less marked stigmata of degeneracy, and, in the case of the first two sequelæ referred to, *post-mortem* examination of the cranium shows no abnormality of the intra-cranial fluid or membranes, apart from those associated with the local or systemic diseases which are the cause of the fatal issue.

The term *dementia*, as defined by the writer, is also applied

in a somewhat different manner from that sanctioned by common usage, in that it refers to a *permanent* psychic disability due to neuronic degeneration, and not to a loss of mental power, which may be temporary or permanent. He employs the term *mental confusion* to connote the symptom-complex, which occurs in many acute cases of insanity, and which is not peculiar to what is commonly described as Korsakow's disease or "polyneuritic psychosis," but occurs to some degree not only in many cases which recover, but in all cases which are developing dementia.

Onset of mental confusion.—As in the highest grades of pure amentia, so in all cases associated with mental confusion, the time of onset of the attack (*i.e.*, when the potential lunatic becomes an actual one) depends on "stress" in the very widest sense, and including the specific causes of mental confusion which are enumerated in the section under remark. The "stress" required may be slight, as when the hereditary disability is marked, in which case the patient rapidly enters an asylum and either recovers, often only to relapse, or remains a permanent inmate; or it may be extremely great, as in the highest psychopaths, where syphilis, alcoholic excess, a generally irregular life, and the severest business strain and worry may be needed, in which case an extremely rapid case of dementia paralytica is likely to ensue; or any intermediate degree may be necessary to determine the breakdown.

Development of dementia.—In the more lowly aments the neurones are relatively stable, as their functional power is so slight that "stress" cannot intervene to any dangerous extent, and consequently these cases do not, as a rule, develop dementia, especially as they frequently die before (premature) senile involution of the cortical neurones occurs. On the other hand, in higher degenerates of any grade whose neurones suffer from deficient durability, it may almost be considered a general law that the higher the development of the neurones, the greater is the degree, or at any rate the more rapid is the progress, of the dementia which results when "stress" has determined the time of onset of the insanity. Until senility occurs, or apart from vascular changes due to whatever cause, the dementia is never severe, the ordinary chronic lunatic with moderate dementia being the common result. It is, however, probably correct as a general average statement (excluding

dementias ensuing on mental confusion following the indirect action of toxines) to remark that the dementia of puberty and adolescence is severer on the whole than the dementia of maturity, and this, again, than the dementia of presenility (*e.g.*, climacteric melancholia, etc.). The primary cause of the development of dementia is thus a deficient durability of the cortical neurones. If this decrease in durability is slight, neuronic degeneration ensues in old age; if it is more marked, it occurs at the climacteric; if it is still more marked, it will appear at maturity; and if it is very marked, it will appear at adolescence or even puberty. On the other hand, in amentia the deficiency is developmental, though in many aments deficient durability also exists, and the mental condition thus often becomes a mixed one owing to the development of dementia in a high-grade ament or in one of the milder types of low-grade amentia.

The second and third parts of the present paper deal, chiefly from the clinical aspect, with "Amentia" and "Dementia" respectively. The data employed, apart from occasional special illustrative cases, are derived from a study of 728 chronic or recurrent lunatics admitted into the East Sussex County Asylum, Hellingly, during the first seven months after the opening of the institution. Practically all the cases were transfers and all were chargeable to the different unions of East Sussex.

These cases were grouped as is shown in the following summary:

AMENTIA.

	M.	F.	T.
(I) Low grade (idiocy and imbecility, primary and secondary, with or without epilepsy) . . .	51	43	94
(II) Excited and "moral" cases . .	22	64	86
(III) Recurrent cases . . .	17	30	47
(IV) Hysteria	—	6	6
(V) Epileptic insanity . . .	6	18	24
(VI) Paranoia (primary and developmental)	10	16	26
Total amentia . .	106	177	283

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DEMENTIA.

	M.	F.	T.
(I) Primarily neuronic (age, "stress" or both):			
(*a*) Senile or "worn-out" dementia	53	70	123
(*b*) Presenile or "climacteric" dementia	18	47	65
(*c*) Mature or "adult" dementia (chiefly from intemperance, syphilis, childbirth, etc.)	26	34	60
(*d*) Premature dementia (approximately "dementia præcox")	57	55	112
(II) Progressive and secondary:			
(*a*) Dementia senilis	9	15	24
(*b*) Dementia paralytica	14	9	23
(III) Special varieties:			
(*a*) Dementia following sense-deprivation	6	4	10
(*b*) Dementia following epilepsy	12	8	20
(*c*) Dementia following cerebral lesions	3	5	8
Total dementia	198	247	445
Grand total	304	424	728

The second part of the paper deals with the subject of amentia. The section on low-grade amentia (idiocy and imbecility) calls for no remark here. Those on "excited and 'moral'" and on "recurrent" cases, however, deserve consideration owing to the fact that they include, as part of their contents, the whole "maniacal-depressive" group of Kraepelin, which has of late attracted so much attention.

In the former of these groups are contained the following general types: (*a*) "moral" cases; (*b*) simple "emotional" chronic mania; (*c*) chronic mania with incoherence and delusions; and (*d*) "cranks and asylum curiosities." About three-quarters of the cases are of the female sex, the proportion varying from 8 : 1 in class (*b*) to about 3 : 2 in classes (*a*) and (*d*).

The cases in these clinical classes respectively show the following prominent characteristics:

(*a*) *Alteration of moral sense*, with a tendency to do desperate things, *e.g.*, to commit suicide or even homicide, to perform acts of self-injury or self-mutilation, to strike, smash or destroy, to intensely irritate those around them, to be sexually inclined in a normal or abnormal manner, etc.

(*b*) *Alteration of emotional and intellectual control, e.g.*, exuberance, instability, vanity, garrulity, childishness, and often violence, treachery and destructiveness. The younger and adult types usually display a more or less marked loss of control over the emotions and instincts. The older types differ from these in the fact that the loss of control affects chiefly the intellectual functions. Their association of ideas is normal, except for its extreme rapidity and complexity. They talk continuously whenever a listener can be found, and they are frequently inconsequent, and show a marked tendency to parenthesis during their descriptions.

(*c*) *Rapid and uncontrolled association of ideas*, with delusions of grandeur, which may or may not co-exist with or follow delusions of persecution. These cases form a half-way house between classes (*b*) and (*d*), and shade gradually into each of these. They differ from the former in being on the whole less troublesome, and in showing an apparently complete incoherence in their association of ideas, and from the latter in the fact that their ideation is simply rapid and uncontrolled, rather than grotesque or symbolical, and resulting in erratic and eccentric conduct.

(*d*) *Stereotyped, symbolical, or grotesque association of ideas*, which leads to weird actions and eccentric general behaviour. These cases are extremely conceited, vain, and grandiose. They are of many types, and may be simply asylum "show-birds," or may possess considerable artistic or intellectual talent. As a class, these cases only differ from certain "sane" individuals in the absurd and grotesque extremes to which they carry their ideas, and their resulting behaviour and actions; and their stereotypism, which often suggests dementia, also only differs in degree from the stereotypism and prejudice which are often seen in the "cranks" of the outside world.

In the latter of these two groups are included all types of "recurrent" case, whether these are still capable of "recovery," or have become permanently insane asylum inmates. About two-thirds of these cases are of the female sex.

The writer would remark in this connection that he is unable to regard mania and melancholia as simple and opposite emotive states (the view of the supporters of the "maniacal-depressive" generalisation [Deny and Camus]), though mere excitement and depression may be such. Mania, whilst at times outwardly indicative of general exaltation of cerebral function, is more often a sign of decreased activity of the higher controlling and latest evolved portion of the cerebrum. Melancholia, on the other hand, whilst it is indicative at times of recuperative general depression of cerebral function, or of impending loss of higher cerebral control, is more often a sign of the onset of permanent general depression of cerebral function, and is thus the objective evidence of impending or developing (presenile) involution of the cortical neurones. With regard to "mania," he would remark that the possessor of one of the finest intellects he has met with was insane, and in a condition of permanent and uncontrolled exaltation of cerebral function. He had earlier in life been a university professor, and a near relative had attained to eminence. This individual might be regarded as the owner of a cerebrum which was too elaborately developed to be properly controlled in its existing stage of evolution. Such brains, working under proper control, may be common in the far distant future. From the normal aspect, it is well known that fine pieces of work have been rapidly done whilst their authors were so intensely absorbed as to be practically in a condition of general cerebral exaltation or mild "sane" mania, for which, however, the subjects had afterwards to suffer in recuperative depression of the cerebral functions. The higher types of recurrent insanity thus grade upwards towards the cerebral hyperactivity of genius, whilst the lower types grade downwards into the analogous cases who are never really sane, although they may legally pass as such. In conformity with these opinions it may be remarked that, cases which develop dementia being excluded, the experience of the writer has convinced him that the greater the degree of cerebral degeneracy the less evident is depression as a symptom or a phase of symptomatology, and *vice-versâ*. Melancholia is, therefore, pre-eminently a characteristic of the latter (recurrent) group, and is of subordinate importance, and often entirely absent, in the case of the former (permanent) group. The writer has, in fact, often noted that cases which at one time

were "circular" have later on partially or entirely lost the phase of depression, and he is disposed to regard this phase, when post-maniacal, as to some extent indicative of a still possible return to the "normal."

It may be remarked that in the "excited and 'moral'" and the "recurrent" types of amentia, the functional disturbance of the cerebrum is of a relatively low order, and, considered from the general aspect, involves (1) decreased action of the higher and latest evolved cerebral functions of control and co-ordination, which results in abnormalities of *immediate* cerebral activity, and in consequent emotional and psycho-motor disturbances of various kinds, and (2) in addition, in the more degenerate types, generally aberrant and subnormal cerebral activity. In other words, the cerebrum, as a machine, is working in a defective manner, and all the "functions of mind," and not merely the emotions, are involved. This abnormal form of cerebral activity is, however, of an *immediate* type, and *does not to any extent involve the revivication of complex and time-related portions of the subconscious content of mind.*

In the case, however, of hysteria and epilepsy, which subjects are dealt with in the succeeding sections, whilst at times the sufferer may be insane owing to loss of higher cerebral control, the symptoms are frequently due to an alteration of personality. This may be conveniently defined as a mental state in which the higher cerebral functions are exercised, not over psychic processes founded on such recently acquired time-related portions of the content of mind as constitute the normal personality, but over psychic processes founded on complex and time-related portions of the subconscious content of mind, which exhibit such abnormal prominence as to entirely replace for the time those recent experiences on which normal cerebral activity depends. In such cases not only one, but several such time-related portions of former experience may separately acquire abnormal prominence and thereby give rise to the phenomena of multiple personality. In the normal individual, on the other hand, the recent time-related personality cannot be voluntarily subordinated, and all that is possible in this direction is the occurrence of some degree of associational elaboration of former sensori-memorial images, which is always imperfect and often incorrect.

In the case of paranoia, which constitutes the last type of

amentia, the mental condition is somewhat different. The personality is altered, but this alteration is due, in the developed state, to the permanently abnormal prominence of certain time-related portions of what should be part of the subconscious content of mind. These particular time-related experiences serve as a basis on which develops a continually increasing aggregation of abnormal psychic units. In other words, in place of the normal gradually changing personality, a certain former personality remains as a permanent basis on which is built up a continually increasing abnormal psychic edifice. In such cases, when they have become "chronic," it is probable that the greater part of the available psychic content consists of symbolic verbal groupings which have become relatively stable through frequent repetition, and that the processes of cerebral association required for the re-integration of the former concepts and percepts which these verbal groupings symbolise, and for the revival of the old sensori-memorial images, are markedly reduced (see remarks on the significance and functions of language, pp. 467–469). These symbolic verbal groupings continue throughout the life of the sufferer to entirely dominate what would otherwise be relatively normal processes of *immediate* cerebral activity, and in this, in effect though greater in degree, resemble the "opinions" of many of the one-idea-ed "cranks" in the outside world.

The writer has here limited himself to expressing his views as to the type of deviation from normal cerebral function which exists in hysteria, epilepsy and paranoia, as he considers that a mere summary of the contents of the respective sections would not serve a useful purpose. He therefore refers the reader to the actual sections for specific details regarding his views on these types of amentia.

He would, however, remark that though all the above types of high-grade amentia can for convenience be separately described, the normal mind is nevertheless one and not several "functions of the brain," and amentia is also one and not several kinds of subnormal or subnormally aberrant mental function, which in different cases merely varies in degree and not in kind. In consequence, whilst all the types of amentia which he has described may be recognised *as types*, cases of an intermediate nature exist between each of these. For example, in many epileptic high-grade aments hysterical attacks may

occur during the day and typical epileptic fits during the night. In conformity with this view, the writer has indicated, throughout the description of high-grade amentia, that amongst "normal" individuals sane homologues of all the types of high-grade amentia are common.

In the third and most lengthy portion of the paper is considered the subject of dementia.

The first section, which deals with the general pathology of mental disease and the functional regions of the cerebrum, need not here be referred to, as it merely generally summarises and in places elaborates the conclusions of the writer which have been already dealt with.

The next section is concerned with mental confusion and its relationship to dementia. The term "mental confusion" is employed to connote, in the broadest sense, the mental symptoms which occur in association with certain pathological states of the cortical neurones which may be followed by the recovery or by a more or less extensive dissolution of these elements. The writer indicates his opinion that *dementia never develops except in such cases as have suffered from a more or less severe grade of the mental confusion which is its necessary precursor.* After a reference to the causation of mental confusion, the symptomatology is described and critically discussed, and it is pointed out that *all the various types of mental confusion* (whether occurring in recoverable cases, in any of the classes of primarily neuronic dementia, in progressive senile dementia, in dementia paralytica, etc.), *conform in reality to a standard description, and in their essential characteristics are one and the same morbid mental state.* The slighter cases, when due to the direct action of toxines (*e.g.*, the less severe types of "polyneuritic psychosis," "puerperal confusion," etc.), recover: the more severe develop dementia, as do all cases due to permanent causes, or occurring in consequence of mere deficient durability of the cortical neurones. Whilst clinical observation may not necessarily enable a definite prognosis to be made as to whether any particular case is presumably recoverable or not, certain symptomatological indications of the likelihood of the development of, or of the actual existence of, dementia, are frequently present. This question is fully discussed in the section under reference.

The writer desires to draw especial attention to the above generalisation with regard to mental confusion and dementia,

owing to its fundamental importance in relation to the unity of mental disease, as on the one hand a condition of Amentia from cerebral sub-evolution and on the other one of Dementia from cerebral involution or dissolution.

The remaining portion of this part of the paper is devoted to a classification of the varieties of dementia. The first group of "primarily neuronic dementia" is divided into the several classes of "senile or 'worn-out' dementia," "presenile or 'climacteric' dementia," "mature or 'adult' dementia," and "premature dementia." These different classes are fully discussed in the several sections, and, except in the case of premature dementia, need little reference here. The senile class naturally includes many types of high-grade amentia who are suffering from cerebral involution. Such maniacal presenile cases as have developed dementia, and which Kraepelin would class under "maniacal-depressive insanity," are necessarily included in the presenile class, as are the cases of presenile melancholia with dementia, which, after Dreyfus, would also be included under "maniacal-depressive insanity." It may finally be remarked that the cases of mature dementia for obvious reasons, since maturity is the period of maximum cerebral activity, are largely induced by intemperance, syphilis (*mild* dementia only), childbirth, etc.

The "premature dementia," which is discussed and illustrated at considerable length, is not synonymous with the "dementia præcox" of Kahlbaum, of Pick, and of Kraepelin, but includes premature dements only. Though the conventional clinical subdivision into types is followed, the writer endeavours to explain on general grounds the characteristic phenomena which form the basis of this. He considers in brief that the cause of these phenomena is to be found in an immature condition of the centres of association of the cerebrum.

In cases belonging to the previous classes of "senile," "presenile," and "mature" dementia, whatever be the respective degrees of involution or dissolution which later on result, the centres of association, both lower and higher, have by frequent repetition necessarily acquired a capacity for relatively stable neuronic groupings as the physical basis of the psychic processes performed by the respective patients; and this statement especially applies to the neuronic groupings in the psychomotor area, which serve as the physical basis for the perform-

ance of "skilled" voluntary accomplishments. In other words, in these classes, considered for the moment from the purely physical aspect, the cerebra are completely built and thoroughly tested machines in full running order at the time when the breakdown is precipitated by too rapid running or by "wearing out."

In the case of the class of premature dementia under consideration the state of affairs is very different. Here there is, in the first place, a highly deficient durability of the cortical neurones; or, to continue the simile, imperfectly tempered material has been employed for the construction of the parts, and the neurones, or the parts themselves, are in many instances imperfectly constructed. Further, though most of, or all, the individual parts are placed in preparatory juxtaposition, even the simpler complexes of construction have only recently and experimentally been grouped into series. This is, in fact, the case even in the more highly endowed patients, in whom the higher complexes of neuronic association have already been tentatively produced.

It is thus only to be expected that, when such a machine is set running at high speed, all kinds of local breakdown will ensue. In the human cerebrum, owing to a structure which in its complexity of construction overshadows any machine of human manufacture, and to the numerous sources of motive power which exist through the medium of the different varieties of sensorial stimulation, complete breakdown is relatively rare, though local stoppages, local anomalous groupings of the simpler complexes, and particularly local repetitions or irregularities of action, are of common occurrence. This is especially obvious, though not peculiar to these, in the case of the more fundamental motor exhibitions, the patient either performing, or not performing, or often repeating, certain actions, and exhibiting, as the essential characteristics of these motor performances, on the one hand a tendency to uncertainty, and on the other a tendency to repetition, of action.

In the case of premature dementia, therefore, it is possible to make a subdivision of the cases into those which do and those which do not exhibit phenomena which originate in sub-evolutional and dissolutive conditions of the psycho-motor area of the cerebral cortex. These are the "approximately 'katatonic'" and "approximately 'hebephrenic'" sub-classes which the writer has employed.

His views as to the position occupied by the "paranoid" type of premature dementia are difficult to summarise. The writer limits the term "paranoia" to cases of developmental origin in which the centre of higher association is the primary region at fault, in that it is unable to exercise its normal functions of co-ordination of, and of corrective and selective control over, the centres of lower association. He thus includes "paranoia" under the heading of "amentia." In this course he is in accordance, in fact if not in terminology, with Bianchi and certain other authors.

In the delusional cases which he excludes from the group of true paranoia, and which are discussed in the section on "Mental Confusion," various local disabilities exist in one or more of the centres of lower association, and these lead either to unharmonious action of these centres in relation to one another, or to more generally aberrant psychic processes, involving also the centre of higher association. This condition is evidence of local cerebral dissolution which slowly becomes widespread; and, for the sake of clearness, it may be spoken of as *dissolutive* in contra-distinction to *developmental paranoia.*

The cases contained in the "paranoid" sub-class of premature dementia are of a similar type to the former, and may be termed, solely for the sake of clearness, examples of *premature dissolutive paranoia.* Such cases occur at all ages and might conveniently be classed as examples of "paranoid dementia." The writer, however, prefers, owing to the fact that all grades of delusion exist in cases of dementia, from the unsystematised to the semi-systematised, or even the systematised, not to make use of any such general symptomatological division, although during the description of premature dementia he has found a sub-class of the kind convenient. His excuse for making an exception in the present instance lies in the fact that, of all the classes of primarily neuronic dementia, the amount of dementia is the greatest in the premature variety, in which, therefore, such a symptomatological division is both possible and convenient for descriptive purposes, although, from the general psychiatric aspect, it is undesirable. In other words—to render his position quite clear—whilst in premature dementia the few "paranoid" cases stand out sharply from the (usually more demented) "hebephrenic" and "katatonic" types, in the other varieties of primarily neuronic dementia no such

"paranoid" group is evident unless *all* cases exhibiting systematised, semi-systematised, or even unsystematised delusions were included in this, to the exclusion of every other symptomatological characteristic. Under such circumstances, as so many further possible sources of delusion exist, owing to the more extensive mental content of the adult individual, a *reductio ad absurdum* would necessarily result.

The writer thus considers that the peculiar symptomatology exhibited by cases of premature dementia is susceptible of a rational explanation, and that this type of dementia is not a special form of mental disease, but merely exhibits unusual features in consequence of the occurrence of neuronic dissolution in a cerebrum which is still immature.

The second group of "progressive and secondary dementia" is divided into classes of "progressive senile dementia" and "dementia paralytica."

With regard to the former class, the evidence that there is a direct relationship between the presence of degeneration of the cerebral vessels and the development of severe dementia is indicated. This subject is discussed in Part I of the present, and in greater detail in a previous paper.

The subject of dementia paralytica is on the other hand considered here at length. The summarised conclusions of the writer are as follows:

He considers that dementia paralytica is a branch of mental disease, and that the subjects of this form of mental disease would, if they had not been syphilised, have suffered from one or other of the types of primarily neuronic dementia. He is further of the opinion that former syphilis is a necessary antecedent to dementia paralytica.

With regard to the first question, he has shown, by a study of the death-rates in mental disease at different ages, and by a comparison of these death-rates with the homologous death-rates in the corresponding general population, that the exclusion of the general paralytic population of an asylum leads to the result that lunatics (particularly those of the male sex) have an extraordinarily low death-rate between the ages of thirty-five and fifty-four. If, on the other hand, the general paralytic population is included in the total lunatic population, this result is not apparent.

He has also pointed out that the morbid anatomy and the

pathology of dementia paralytica do not differ in their essential features from those of progressive senile dementia. He has further shown, by a classification of the types of dementia paralytica and a comparison of these with the varieties of primarily neuronic dementia, that the two series are homologous.

On these various grounds he has based his contention that dementia paralytica is a branch of mental disease. As confirmatory evidence he has pointed out the high percentage of heredity of insanity and of parental and family degeneracy which can be obtained in cases of dementia paralytica, and he has shown that cerebral under-development occurs in certain types of this form of mental disease.

With regard to the second question, he has indicated his reasons for considering that former syphilis is a necessary antecedent to dementia paralytica. He is of the opinion that the ordinary sane individual and the ordinary psychopath or potential lunatic, if possessed of cortical neurones of average durability, may suffer from syphilis with impunity as regards the later onset of dementia paralytica, and he considers that the same statement may be made with regard to the syphilised lunatics with little or no dementia, who are fairly common in asylums. On the other hand, he holds that a psychopath who possesses cortical neurones of subnormal durability, and who, apart from an attack of syphilis, would develop a moderate grade of dementia, would, after an attack of that disease, sooner or later suffer from one or other of the types of dementia paralytica.

He thinks that the important feature in which dementia paralytica differs from progressive senile dementia consists in the possession, by the subjects of former syphilis, of a permanently enhanced capacity of reparative reaction on the part of the non-neuronic elements of the encephalon. In both cases neuronic dissolution and non-neuronic reparative reaction occur *pari passu*. In the case of dementia paralytica, non-neuronic reparative reaction is more or less intense, and vascular degeneration is relatively slight; in the case of progressive senile dementia non-neuronic reparative reaction is relatively feeble and vascular degeneration is relatively severe. He would illustrate this point by a coarse analogy, comparing dementia paralytica to certain types of progressive renal cirrhosis and progressive senile dementia to senile renal cirrhosis.

On these grounds he includes dementia paralytica and pro-

gressive senile dementia under the common group of "Progressive and Secondary Dementia."

This part of the paper finally contains groups of "Dementia following Sense-Deprivation," "Dementia following Epilepsy," and "Dementia following Cerebral Lesions."

The subject of "Dementia following Sense-Deprivation" is considered at greater length than the frequency of the condition might appear to demand. This course is adopted for the following reason. In the case of the preceding groups the dissolution or involution of the centre of higher association is either primarily neuronic or is also due to extra-neuronic but intra-encephalic morbid states. In the case of dementia following sense-deprivation, however, dissolution of the centre of higher association occurs in cerebra which are permanently maimed, in the neuronic sense, in their functionally lowest and most stable portions, namely, one or more of the centres of projection; and the exciting cause of the dissolution of the centre of higher association in such cerebra is the stress induced by the necessarily abnormal modes of lower cerebral association which result from this maiming. The consideration of the subject is therefore necessarily preceded by a discussion of the processes of lower cerebral association and of the relationship of language to these.

As has already been indicated, the writer recognises three grades in the hierarchy of cerebral function, namely: (1) centres of projection for the reception of sensations; (2) centres of lower association for the recording of sensori-memorial images and the association of these into complex psychic units which differ, not fundamentally but in detail, on every occasion on which they are evolved or employed; and (3) a centre of higher association which is concerned with the general control and co-ordination of psychic processes and the grouping of the complex psychic units evolved by processes of lower association into harmonious series of concepts by means of voluntary attention and selection. He thus regards perception and conception as *processes*, and does not predicate the existence of *centres* for percepts and concepts, terms which in his view are psychological generalisations for psychic products that require integration from sensori-memorial images on each occasion on which they are evolved. This integration occurs by the aid of the cerebral mechanism of language.

Words may be described, without serious error, as mental algebraic symbols which, without interpretation into their conceptive, their perceptive, and finally their sensori-memorial equivalents, are meaningless. Language, in other words, may be compared to the symbolic system employed by mathematicians, and the ever-varying sensori-memorial complexes which words symbolise may be likened to the numerals of arithmetic.

A word, *per se*, represents merely an auditory or visual sensation, or a cheirographic or articulatory kinæsthetic impression, unless it is employed as a symbol on which to integrate the percept or concept which it signifies, and for such integration the cerebral mechanisms or associational systems connecting the different projection and sensori-memorial regions of the cortex are needed.

Further, both these developed percepts and concepts, and also the associational processes involved in their formation, differ not fundamentally but in detail on every occasion on which they are evolved or performed.

Words may arise into consciousness through any one of the four language-spheres. When, however, they are voluntarily and silently reproduced, *i.e.*, thought of, words are invariably awakened through the articulatory word-centre under normal conditions. They cannot be voluntarily repeated in thought by means of the cheirographic centre if the hand is not actually moved, though such hand-movements may be replaced by slight movements of the head, or even of the lower jaw or the eyes, through the agency of their respective motor spheres. If words should spontaneously arise in the visual or the auditory word-centre, the condition is so abnormal as to constitute a hallucination, which the subject may or may not be able to distinguish from a true visual or auditory sensation.

However they may arise into consciousness, words naturally possess very different symbolic values. Illustrations need not be given here, as the subject is dealt with in the section under present reference. Since this section was written a recent paper by E. H. Rowland has come under the notice of the writer. In it the author discusses "The Psychological Experiences connected with the Different Parts of Speech." The conclusions of the author with regard to the symbolic values of the different parts of speech, and those expressed by the writer in the section referred to, are in accord.

The auditory, visual, cheirographic, and articulatory word-centres thus merely signify the cortical regions in which lie the physical bases of mental algebraic symbols. These, unless they serve as inciting agents from which spread, in different directions throughout the cerebrum, complex impulses of association, signify no more than unmeaning sounds, shapes, and musculo-kinæsthetic sensations.

Language is produced by the suitable co-ordination of the verbal content of the auditory and articulatory word-centres. It is originally acquired by imitation under the influence of auditory sensations, and in educated persons language is more highly evolved owing to education of the visual and cheirographic spheres. When once it has been acquired, however, language (*i.e.*, functional activity of the several word-centres with their commissural systems) is not necessarily employed as the instrument of thought, although it has been primarily evolved for this purpose. Examples are common in which the mechanism of language is employed in a purely mechanical manner; and in the text of the paper several illustrative examples are given.

This summary would become of inordinate length were the above remarks critically compared with the views of the numerous authors who have written on the subject. Those, however, of Bianchi, who has recently elaborately discussed the functions of the cerebrum from the psychological standpoint, require a passing mention. This author, whilst fully recognising the necessity of language for the *reproduction* of thought, considers that, apart from words, there exist in the cerebrum a centre for concepts in the frontal lobes and centres for percepts in the post- and infra-Rolandic regions of the cerebral mantle. He recognises two grades only of cerebral function, (1) a region of government in the frontal lobes, and (2) a mantellar parliament existing in the various perceptive zones; and he regards language simply as a mechanism for the reproduction of thought. He considers that even abstract conceptions exist apart from words. "The coalescence of the word with the abstract conception, and the impossibility of separating them, do not warrant us in denying that they are formed in different areas" (p. 131). This quotation is inserted out of fairness to the author, though the writer has not misinterpreted his opinions, as he devotes several pages to the endeavour to prove that per-

cepts and concepts can exist *in the absence of words*. What Bianchi, however, really clearly indicates is that words and language can exist in the absence of percepts and concepts, which is a very different matter.

In connection with this question, the recently published views of Pierre Marie are of importance. This author considers that in all types of aphasia (with the exception of anarthria, which he considers not to be aphasia at all) diminution of intelligence is present. "C'est qu'il y a chez les aphasiques quelque chose de bien plus important et de bien plus grave que la perte du sens des mots ; il y a une *diminution très marquée dans la capacité intellectuelle en général*" (p. 241). The elaborately detailed observations of Marie do not give support to the views of Bianchi, but are readily explicable if, as is the opinion of the writer, language be regarded as a necessary symbolic instrument for the carrying on of psychic processes, and not merely as an instrument for the expression of separately elaborated psychic products which already exist in certain cerebral centres.

During the description of "Dementia following Sense-Deprivation," the writer separates congenital from acquired cases, and indicates how deafness is a more serious deprivation than blindness. The examples of deaf-mutism which are cited, all of whom are high-grade aments, exhibit not only dementia, but originally defective intellectual powers and an imperfect visual and cheirographic substitution of the auditory and articulatory language spheres. Further, these cases differ from those suffering from acquired sense-deprivation in presenting no signs of irritability, excitability, and stubbornness.

In the section on "Dementia following Epilepsy" is repeated the observation that epilepsy occurs most frequently in association with mental disease in those types of the latter in which cerebral degeneration is most marked. For example, 37·2 *per cent.* of low-grade aments (idiots and imbeciles), 12·7 *per cent.* of high-grade aments, and only 4·5 *per cent.* of cases of dementia suffer from epilepsy. It is remarked that the general effect of co-existing epilepsy is harmful in all types of mental disease and accentuates the special symptomatology. With regard to "Dementia following Epilepsy," the writer indicates the marked grade of dementia which ensues, and also the impossibility, in the absence of a history or evidence of

epilepsy, of distinguishing between cases of primarily neuronic dementia and of epileptic dementia.

The third part of the paper concludes with a reference to "Dementia following Cerebral Lesions," which calls for no remark, as, apart from dementia, the symptomatology presented by such cases is individual and accidental.

In concluding this general review and summary the writer would remark that, apart from the clinico-pathological evidence which he has adduced in favour of the thesis he advocates, recent research in psychiatry tends more and more to decrease the number of "mental diseases," and to make for the unity of insanity as on the one hand the symptomatological expression of cerebral sub-evolution, and on the other that of cerebral dissolution and involution. The generalisation of "dementia præcox" groups together many types of the insanity of adolescence. The discovery of the two juvenile, the tabetic, the chronic degenerate, and the senile forms of dementia paralytica has widened the original conception of general paralysis as a peculiar acute mental disease of adult life. The generalisation of "maniacal-depressive insanity," recently still further extended (Dreyfus) by the inclusion of presenile melancholia, has classed together many types of cerebral degeneracy. Finally, even the generalisation of "polyneuritic psychosis" has recently been extended by Knapp, who recognises numerous aberrent types of symptomatology.

These few illustrations of the direction in which recent research in psychiatry is advancing, serve collectively and individually as evidence in favour of the broad generalisation of amentia and dementia advocated by the writer in this paper. Whilst he does not presume to imagine that he has done more than add a further example to the numerous classifications of mental disease which have been published, he is nevertheless convinced of the general correctness of the clinico-pathological basis on which his generalisation of amentia and dementia is founded, and of the approximate accuracy of the classification of mental disease which he advocates.

Though his attempt to indicate the physical basis of mental disease may for the present be doomed to failure, he is satisfied that future histo-pathological research will confirm the general correctness of his observations, and by extending our knowledge of the functions of the cerebrum will eventually demon-

strate not only the general physical basis of mental disease which he claims to have proved, but also a special physical basis for many of the clinical types of symptomatology which are commonly regarded as individual mental diseases.

The writer desires, in conclusion, to express his grateful thanks to Doctors Jones and Mott, Taylor, and Wiglesworth, for the use of the clinico-pathological material which he has had the privilege of collecting at the Claybury, Hellingly, and Rainhill Asylums respectively. He also wishes to express his indebtedness to Dr. G. A. Watson for the loan of histological specimens, and to Mr. F. J. Abram, who has kindly drawn certain of the diagrams and has rendered valuable assistance in the preparation of the photographs with which the paper is illustrated.

(1) The writer does not wish this "General Review and Summary" to be regarded either as an abstract of the paper or as a summary of conclusions.

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