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PART I.—ORIGINAL ARTICLES.

On the Weight of the Brain, and on the Circumstances affecting it.

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THE weight of the brain in insane persons has been investigated by Dr. Parchappe in France, Dr. Bergmann in Germany, and on a larger scale, by Dr. Boyd in this country.* Further observations, however, were, for many reasons, to be desired; and having during many years past either weighed myself, or caused to be weighed, the brain of nearly every patient who has died whilst under my care, I ventured to think the large series of observations thus obtained, and which amount to 470 cases, were worthy of being collected, analysed, and compared with the weights recorded by previous observers.

The brains were examined in the usual manner, by slicing from above downwards. The cephalo-spinal fluid, effused serum, and blood, were allowed to drain away before the brain was weighed. The dura mater was, of course, removed; but the pia mater and arachnoid, if in part detached for examination, were weighed with those parts of the encephalon to which they belonged.† The crura cerebri were divided close to the pons, and the two hemispheres weighed separately. The medulla oblongata was divided about half an inch below the olivary bodies; and the cerebellum, pons, and medulla weighed separately.

The weights employed were avoirdupois, which, to facilitate calcu-

* Many weights of the brains of insane persons have been recorded by Dr. Bucknill, Dr. Skae and others, but hitherto they have only been partially analysed.

† It would be more accurate, with Tiedemann, to weigh the brain entirely denuded of its investing membranes. This, however, has not been generally attempted, and is hardly practicable with the encephala of many of the insane.

lation, are expressed in the tables in ounces and tenths. I have added, likewise, in all the tables, the equivalent weights, in *grammes*, for the sake of ready comparison with the observations and tables of the Continental anatomists. The trifling discrepancies which may be observed, I believe, have resulted according to whether ounces had to be converted into grammes, or grammes into ounces, and from the fractions of grammes and of tenths of ounces being disregarded. A smaller weight than the ounce, enabling us to dispense with the necessity for fractions, and for other reasons, was much to be desired for such physiological purposes as those under consideration, and the gramme (of 15·438 grains English) is well adapted for this purpose. Moreover, as the use of the metrical system of weights and measures in this country has been sanctioned by a permissive Act of Parliament, passed in the session of 1864, we may expect that statical observations made by men of science in England will, by degrees, be assimilated to those of the greater part of Europe. The use of different standards of weights and measures in the different countries of the civilised world is a serious impediment to the progress of science. Uniformity in this respect is reserved for posterity; let us, in our day, contribute to so desirable a result.

Tables I and II.—These tables, which show the weights of the brains of 257 men and 213 women, at decennial periods of life, collected at the Wilts County Asylum, give the *maximum* and *minimum*, as well as the *average* weights, so as to bring out the extremes between which the weights oscillate. The difference between the maximum and the minimum weights, both as regards the cerebrum, the cerebellum (inclusive of the pons varolii and medulla oblongata), and the entire encephalon, is greater, I think, than before observed, amounting to 80 or 90 per cent. (·73—·96) on the cerebrum and entire encephalon, and to as much as 100 or 115 per cent. on the cerebellum.

Brains of Men.

	Maximum.			Minimum.			Excess per Cent.
	Oz.	Grmm.		Oz.	Grmm.		
Cerebrum	54·	1530	.....	27·5	779	.....	96
Cerebellum, &c....	8·	226	.....	3·25	92	.....	115
Encephalon	62·	1757	.....	32·	907	.....	93

Brains of Women.

	Maximum.			Minimum.			Excess per Cent.
	Oz.	Grmm.		Oz.	Grmm.		
Cerebrum	47·5	1346	.....	26·	737	.....	82
Cerebellum, &c....	7·	198	.....	3·5	99	.....	100
Encephalon	53·2	1507	.....	30·7	870	.....	73

It is possible that the fluctuations in weight have a wider range in the insane than in the sane. The small, or microcephalous brains,

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are mostly those of idiots or congenital imbeciles, of whom a certain number are found in all asylums; and the larger are those of megalocephalous persons, who, under the influence of efficient exciting causes, and especially of epilepsy, are perhaps more liable to mental disorders than those with brains of average size. The numbers, however, of these exceptionally large and small brains are not in such proportions (see Table X), as materially to disturb the mean weights. The one extreme seems to neutralise the other.

It is not the exceptional instances, but the average results, which in the sciences of observation should most engage our attention, and which afford the surest evidence. The average weights are given in the tables for each decennial period of life; but to these we cannot attach much value for the ages below 20 years, of which there were only six of the male and three of the female sex. At the foot of these and of the following tables, I have reunited the numbers into three periods. 1. That of youth, from 10 to 20 years; 2. That of maturity, from 20 to 60; and, 3. That of decadence, from 60 to 90 years and upwards. Postponing the more particular consideration of the influence of sex and age on the weight of the brain, it will be seen that the average weights for all ages, as deduced for the insane from these tables, are as follows:—

	Brains of Men.			*Brains of Women.*			
	Oz.	Grmm.		Oz.	Grmm.		Excess per Cent. in Men.
Cerebrum	40·2	1139	.....	35·6	1009	.....	12·
Cerebellum, &c.	6·	170	.....	5·4	153	.....	10·
Encephalon ...	46·2	1309	.....	41·	1162	.....	12·

These weights do not differ, except in a minute fraction, from those which are obtained for the period of maturity in each sex, from 20 to 60 years of age. In the sane the difference is more pronounced between the weight of the brain in the middle and that in the more advanced period of life.

I do not, in these tables, show the weight of the two hemispheres of the cerebrum distinguished separately, though in nearly every instance* they were so weighed. Dr. Boyd, by whom this method has likewise been followed, in describing the results obtained by him in 528 brains of the insane, observes:—"It is a singular fact, confirmed by the examination of nearly 200 cases at St. Marylebone, in which the hemispheres were weighed separately, that almost invariably the weight of the left exceeded that of the right by at least the eighth of an ounce."† Though the results obtained by me do not confirm Dr. Boyd's observations, I do not wish to be understood as saying that they refute them. A nice, and at times difficult, sec-

* In only two cases was the cerebrum weighed as a whole.
† Boyd, 'Phil. Trans.' 1861, vol. cli, p. 261.

tion is requisite to ascertain the weight of one hemisphere, as compared with that of the other; and in dividing, it may be, a softened great commissure, it is difficult to cut always in the exact median line. As a moiety only of the brains were actually weighed by myself, I have not thought it desirable to embody in the tables the weights of the two hemispheres. I may, however, here give an abstract of the recorded results, though disclaiming for them any pretensions to minute accuracy:—

	Brains of Men.				*Brains of Women.*			
Years of Age.	Right Hemisphere.		Left Hemisphere.		Right Hemisphere.		Left Hemisphere.	
	Oz.	Grmm.	Oz.	Grmm.	Oz.	Grmm.	Oz.	Grmm.
16—20 ...	20·37	.	20·33	.	19·62	.	19·62	.
20—30 ...	21·	.	21·02	.	18·	.	18·02	.
30—40 ...	19·50	.	19·45	.	17·55	.	17·53	.
40—50 ...	20·23	.	20·31	.	18·1	.	18·	.
50—60 ...	20·38	.	20·21	.	17·5	.	17·9	.
60—70 ...	20·21	.	20·19	.	18·33	.	18·25	.
70—80 ...	20·01	.	19·9	.	17·34	.	17·35	.
80—90 ...	19·42	.	19·5	.	17·59	.	17·59	.
Averages.								
16—90 ...	20·14	570	20·11	569	18·04	511	18·03	510

Since the above was written, I have observed that the late Professor Wagner has controverted the supposed greater weight of the left hemisphere. He employs almost the same arguments as those used above, and gives the results obtained by him in eighteen weighings of the two hemispheres of brains which had been dissected and preserved in spirit. Out of these the right hemisphere was the heavier in ten, and the left in six instances; in two they were of equal weight. The average weights for the whole were 427 grmm. for the right, and 426 grmm. for the left hemisphere.* Fresh careful observations are certainly needed before we can admit the general preponderance of the left hemisphere over the right.

Tables III and IV.—In these tables I have brought together the average weights of the brain at the different ages, as observed by me in Wiltshire, and those obtained by Dr. Boyd for 527 cases in the adjoining county of Somerset. These, as well as the cases reported by myself, belong, of course, to the pauper class, or to that just above it, which almost necessarily falls into the pauper class, under the pressure of mental disorder. To these I add the weights of 59 other brains formerly (1838-1849) weighed by me at the Friends' Retreat, near York. These were from persons of a more educated middle class of society, from all parts of England. The average weights for these last is considerably greater than that for the poor of Wilts and Somerset. A greater number of observations is de-

* Wagner, 'Vorstudien des Menschlichen Gehirns,' 1862, ii, 89-92.

sirable for the middle and upper class in particular, and also for the poor in other parts of this country, and especially in the northern counties. In the concluding columns of these tables the observations from the three asylums are united into common averages, which, for the present, may be taken as representing the average weights of the brain for the insane of England.

TABLES V and VI.—In these tables the average weights of the brain observed in the three English asylums are compared with those obtained by M. Parchappe for 284 insane French, at the asylum of St. Yon, near Rouen (Seine-Inférieure);* and also with those recorded by Dr. Bergmann, for 242 Germans, at the asylum at Hildesheim, Hanover.† It will be seen that the weights, at nearly all ages, are higher in the French than in the English observations, and that they are much higher in the German ones. Further observations are desirable for both these countries. I have also analysed and inserted in their proper place the 560 brain-weights collected by Dr. Skae, for the insane of the south-east of Scotland, and which are shown to be considerably higher than those of either English, French, or Germans.

TABLES VII and VIII.—The preceding tables refer to the insane. In those now before us I bring together the observations as to the weight of the brain in persons of sane mind, in a few of the principal countries of Europe. In the first place there is a very extensive series of weights for the poor of the west of London, obtained by Dr. Boyd at the Parochial Infirmary of St. Marylebone, between the years 1839 and 1847.‡ These "most colossal" tables of Dr. Boyd's, as they are designated by Wagner, comprise the weights of no fewer than 2030 brains at all periods of life, of which 1424 are of adults, of 20 years of age and upwards. This is by very much the largest series of cerebral weights yet made by one observer; and is particularly valuable, as comprising a considerable number of weights of the brain in young infants and children of all ages, from the prematurely and stillborn up to 14 years of age, as to whom observations were previously very scanty. With the

* Parchappe, 'Traité de la Folie,' 1841, pp. 345-353.

† Bergmann, "Gewicht des Gehirns.," 'Zeitschrift für Psychiatrie,' 1852, ix, 361.

‡ Boyd, 'Tables of Weights of the Human Body and Internal Organs in the Sane and Insane,' from 2614 post-mortem examinations: 'Phil. Trans.,' 1861, vol. cli, p. 261. Dr. Boyd had been preceded in his researches on the weight of the brain and other organs, at the Infirmary of St. Marylebone, by Dr. Sims and by Dr. Clendinning. The valuable tables of the former are printed in the 19th vol. of the 'Med.-Chir. Transactions' (1835, p. 352), and those of the latter in the 21st vol. (1838, p. 33). The former weighed 253, the latter 193 brains. Dr. Clendinning's observations show a greater brain-weight in death from disease of the heart, than in death from other causes, phthisis excluded. The difference in the male sex amounted to 2·1 oz., or nearly 5 per cent.; the average weight in disease of the heart being 48·5 oz., in other diseases 46·4 oz., in phthisis 46·2 oz.

observations as to the maximum, minimum and average weights of the brain, (under the heads of cerebrum, cerebellum, pons and medulla, and entire encephalon), are found the maximum, minimum, and average weight of the body and the stature; so that there can be little doubt that, if at all, the law of increase of the human brain may be deduced from these observations. I had hoped to have been able to have digested the whole of the observations here glanced at into two large tables, one for each sex, which would have proved very useful for easy reference. The task, however, is one which I am obliged to decline. I have, however, extracted and arranged the average weights of the brain for the two sexes at every period of existence, and have given these in Table IX.

The brains weighed by Dr. Boyd, at St. Marylebone, may be regarded in general as those of the sane, but not without qualification. Diseases of the nervous system were the cause of death in 354 cases, or 17 per cent. of the whole;* and Dr. Boyd informs me that many of these were cases of acute or chronic insanity, with or without epilepsy, and that a few were idiots. We may, perhaps, estimate the insane as forming 5 per cent. of the whole.

The next series of weights embraced in these tables consists of the less extensive but very accurate observations of Dr. Reid and Dr. Peacock, which have been carefully analysed by the latter.† They are those of the brains of patients in the Royal Infirmary of Edinburgh, dying from such acute or chronic diseases or accidents as are usually treated in the hospitals of great cities. Those dying with disease of the brain are not included in the general table. Among the brains weighed were some of Highlanders, and a few of Orkney and Shetland men, but the great majority were of Lowland Scotch. It is not improbable that for the most part they were of a somewhat better rank, and did not include so many of the degraded pauper class as the inmates of the Infirmary of St. Marylebone. The average weights are higher than those of any series yet published of the brains of sane persons.

The third series of brain-weights in this table is taken from the great Table of Weights of the Brain collected by the late Professor Wagner, which comprise 964 cases for the two sexes, and all ages, though principally of twenty years and upwards. This table is compiled from very heterogeneous materials, and it embraces a large proportion of the brains of insane persons, and of many others in

* Loc. cit., p. 260.

† Peacock, "Tables of Weights of the Brain, &c.," 'Monthly Journal of Medical Science,' vol. vii (N. S. i), 1847; reprinted 1861. It is interesting to compare the brain-weights obtained by Dr. Peacock in London ('Pathol. Trans.,' vol. xii, 1860-61) with those he had previously procured in Edinburgh. They are not numerous, but confirm the view of the average English brain being somewhat lighter than that of the Scotchman. In 28 men, of 20 to 60 years, it was 49 oz., or 1388 grmm., being 1 oz. (29 grmm.) less than in the Scotch. (See p. 636.)

whom there was disease or a suspicion of disease. The table appears to be constituted as follows:

Reported by	Sane. M.	F.	T.		Insane. M.	F.	T.
Sims, *English*	121	127	248	...	1	4	5
Huschke, *Germans*	43	31	74	...	.	.	.
Tiedemann, „	42	16	58	...	.	.	.
Wagner, „	19	13	32	...	.	.	.
Virchow, „	1	4	5	...	.	.	.
Brains of Cuvier, Byron, Dupuytren	3	4	3	...	.	.	.
Bergmann, *Germans*	.	.	.	...	152	90	242
Parchappe, *French*	5	4	9	...	166	122	288
Sane	234	195	429	Insane	319	216	535
				Sane	234	195	429
				Totals	553	411	964

Wagner's table has been subjected to analysis by two distinguished anthropologists, Professor Broca, of Paris, and Professor Welcker, of Halle. M. Broca excludes all the brains of insane persons, as well as those in which there is a suspicion of disease. The total number is thus reduced to 347 at all ages, or to somewhat more than one third of the whole. Nearly half of these selected cases must be those of English, reported by Sims, and which, like those of Dr. Boyd, were collected at the Infirmary of St. Marylebone. The other moiety must be almost exclusively those of the German observers (exclusive of Bergmann), and, with trifling exceptions, are no doubt of the brains of Germans. Professor Welcker confines his attention to the brain-weights of persons between twenty and sixty years of age, but takes all at this period of life, rejecting only four observations,* and adding nine of his own. This gives 673 examples, namely, 415 of men and 258 of women. The average weight obtained by Welcker for the period of maturity (twenty to sixty years), shows an excess of 19 grmm., or nearly three quarters of an ounce, for the men, and one of 6 grmm., or one fifth of an ounce, for the women, as compared with that obtained by M. Broca for the selected cases. This result is due probably to the presence of brains diseased from other causes than mere insanity, in which we shall find reason to believe that the mean weight is usually diminished by the atrophy of this organ, the tendency to which is materially increased. It is obvious that the more the brains weighed in these observations are restricted, when tabulated, to distinct classes, the more valuable they become for the purposes of science. To make, however, this part of the table complete, I have calculated the average weights from Wagner's table for the four periods of life, passed over by Welcker, viz., ten to twenty, sixty to seventy, seventy to eighty, and eighty to ninety

* Welcker, 'Wachsthum und Bau des Menschlichen Schädels,' 1862, p. 36. The four brains omitted are Nos. 1, 3, 4, and 179; being those of a case of hydrocephalus, of Cuvier, Byron, and Dupuytren respectively.

years. It is curious that for all these ages the average weights are decidedly lower in the miscellaneous and unselected cases than in those selected by M. Broca. Partially microcephalous brains among the young, and the atrophy common to advanced life, and especially to the insane, here come into play to confuse and vitiate the results.

TABLE X.—I have in this table arranged all the brains weighed by me at the Wilts County Asylum in five classes, according to their large, medium, or small size. This has been done with the view of showing the relative number which much exceed, or much fall short of, the average weight. The proportion of megalocephalous or great brains, and of microcephalous or little brains, are seen at a glance by this arrangement. In the absence of any considerable series of healthy brains, the individual weights of which are given, I have analysed all those of adults from twenty to ninety years of age in the table of Wagner, and have introduced them for comparison in a second series of columns. I should have preferred, for this purpose, Dr. Boyd's weights of brains as obtained by him at St. Marylebone, had the form in which they are recorded made them available.

After these explanations of the arrangement of the tables before us, we may consider the general conclusions which appear deducible from them. In doing this, we may review the apparent influence of Sex, Age, Weight and Stature of the body, Ethnological Characteristics and Race, Social Position and Education, and of Disease, particularly Insanity and Idiocy, on the average weight of the brain.

I. SEX.

The generally smaller size of the head, and consequently of the brain, in the female, must have been obvious to the earliest observers. The record of the fact seems to date from Aristotle. My own observations fully confirm those of preceding writers as to the average weight of the adult male brain being about 10 per cent. greater than that of the female. As Professor Welcker expresses it, "The brain-weight of the male (1390 grmm.) is to that of the female (1250 grmm.) as 100 : 90." Slight variations are observable in the brain-weights of the two sexes, as given by different observers, but it will be seen that the average difference is expressed with much accuracy by these figures. In this particular there is little difference whether we regard the brain-weights for the two sexes, in the sane or in the insane. On comparing Tables III and IV, which show the weight of the brain in the two sexes in three English asylums, we obtain the following results:

Ratio of the Brain-weight of the Insane in the Two Sexes.

	Male.	Female.
20—60 years . . .	100· . . .	91·
20—90 „ . . .	100· . . .	90·

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In like manner, comparing Tables VII and VIII, showing the weight of the brain in three countries of Europe, we find as follows:

Ratio of the Brain-weight of the Sane in the Two Sexes.

	Male.		Female.
20—60 years . . .	100·	. . .	90·
20—90 „ . . .	100·	. . .	89·9

The difference between the average weight of the male and female brain, according to Welcker's computation, is 4·94 oz., or 140 grmm., but, according to Dr. Peacock's observations on the Scotch, 5·3 oz., or 150 grmm. Altogether, we must agree with Professor Welcker, that Wagner expressed himself much too cautiously when he says only that "male brains have in general a greater absolute weight than female."*

Some have supposed, with Tiedemann, that the less size of the brain of the female is due simply to her less stature. This, however, is not the case; and it was long since shown by M. Parchappe, though from a too restricted number of weights, that the difference was greater than could be accounted for in this way.† I am able to confirm this opinion from calculations founded on the great Tables of Dr. Boyd for St. Marylebone. For this purpose I have examined and compared the average stature and brain-weight for men and women, at the decennial periods from twenty to sixty. For these four periods of life, Dr. Boyd gives the average stature of 414 men and 356 women, and the average brain-weights of 425 men and 370 women. Now, the mean stature for these four periods of life may be taken as 5 ft. 6·5 in. (1·689 metre), for the men, and 5 ft. 2 in. (1·574 metre), for the women; whilst the average weight of the brain is 47·8 oz. (1354 grmm.) for the men, and 43·2 oz. (1224 grmm.) for the women. If then, as before, we take the figures 100 to represent the brain-weight, and also the stature of the male, we shall find that the ratio of these are for the female as follows:

Ratio of Stature and Brain-weight in the Two Sexes.

	Male.		Female.
Stature	100·	.....	92·
Weight of Brain	100·	.....	90·3

Whilst the brain-weight is nearly 10 per cent. less in the female than in the male, the stature is only 8 per cent. less. As M. Broca expresses it, "The relative small size of the brain of the female depends at the same time on her physical and her intellectual inferiority."‡

* Wagner, l. c., p. 92. Welcker, l. c., p. 39.

† Parchappe, 'Recherches sur l'Encéphale, Prem. Mémoire,' 1836, p. 76.

‡ Broca, "Sur le Volume et la Forme du Cerveau," p. 15; 'Bull. de la Soc. d'Anthropologie de Paris,' 1861, t. ii.

II. Age.

The anatomists who wrote early in the present century, Soemmering, the Wenzels, and even Sir W. Hamilton and Tiedemann, held that the brain attained its greatest development at a very early period, viz., at three, seven, or, at the latest, from seven to eight years of age. More accurate observations agree in showing that up to the period of puberty, or the middle of the second decade of life, the weight of the brain goes on progressively increasing from, as appears, about 11·67 oz., or 331 grmm., for the encephalon of the new-born male, and 10 oz., or 283 grmm. for that of the new-born female, to 46 oz. (45·96) or 1302 grmm., for the former, and to 40·78 oz., or 1155 grmm., for the latter, at the years between seven and fourteen (see Table IX). Dr. Boyd shows, however, that the average weight of the brain of "still-born" children at the full period, was much greater than that of the "new-born" who were viable. The death of a large proportion of the former was no doubt owing to the exceptionally large size of the head. Hence, likewise, "the large number of still-born male infants as compared with females, 51 to 32,* and the necessity of resorting to craniotomy in five instances in the males only." The average weight of the brain of those dying at the moment of birth is evidently much greater than that of those who survive. Again, when we turn to the same table, we find that the highest figures for any period of life are those for fourteen to twenty years, viz., 48·54 oz., or 1374 grmm. for the male, and 43·94 oz., or 1244 grmm. for the female sex. Are we then to conclude that, differently from the rest of the internal organs, the brain attains its maximum, or nearly maximum development, at or before the period of adolescence, and then sustains a diminution? This was the opinion of Dr. Sims,† which other observations at first sight appear to confirm. Thus, in M. Broca's selected cases from Wagner (Tables VII and VIII), the average weights for the period from ten to twenty years are higher in both sexes than those for any succeeding decade. We can hardly believe that the weight of the brain undergoes an actual diminution at the age of twenty, and again increases in the same individual after thirty years. Rather, with M. Broca, it is to be supposed that an exceptionally exuberant growth of this organ at the period of adolescence, which is by no means rare, has a tendency to destroy the equilibrium between

* Out of these cases, as shown in these tables of Dr. Boyd's (see Table IX), the brain was examined and weighed in forty-three males and thirty-one females; l. c., pp. 243, 260.

† Sims, "The inference from this table is, that the average weight of the brain goes on increasing from one year old to twenty; between twenty and thirty there is a slight decrease in the average; afterwards it increases, and arrives at the maximum between forty and fifty; after fifty, to old age, the brain gradually decreases in weight." 'Med.-Chir. Trans,' vol. xix, p. 358.

the nervous system and the rest of the organism, and thus to compromise existence. It is well known that the large-headed often die in early life.* Here, as in the case of the still-born, the average weight of the brain of the dying cannot be taken as the same as that of the living, but is no doubt considerably in excess of it.

Passing over these apparent exceptions, it may in general be admitted that the average weight of the brain undergoes a progressive increase to a period somewhere between the twentieth and the fortieth year. According to all the tables before us which refer to the sane, the greatest average weight for the male brain is that for the middle decennial period, or from thirty to forty years; and this, as M. Broca observes, agrees perfectly with what we know of the continued development of intelligence during the whole of this period. For women, the full average size of the brain is perhaps attained within the preceding decade, of twenty to thirty years; but the difference between the two sexes in this respect is not great. From forty to fifty years there is a slight diminution in weight, and a greater one between fifty and sixty. After sixty years, the rate of decrease is still greater; the process of decay becomes more and more rapid, and thus in the eighth decade of existence the average weight of the brain is less by more than three ounces (80—90 grmm.) than it was in the fourth decade. In the aged, on the average, the weight of the brain decreases *pari passu* with the intelligence. There are many exceptions to this general law, and some, particularly of the more cultivated and learned class, preserve to extreme age all the fulness and vigour of their faculties. The brain of such men, as the late Professor Gratiolet observes, remains in a state of perpetual youth, and loses little or none of the weight which belonged to it in the prime of life.

III. Weight of the Body and Stature.

The relations of the weight of the body and of the stature to the weight of the brain have as yet been investigated on insufficient data. From his observations, which, for all ages and both sexes, were thirty-five in number, Tiedemann concluded "the human brain is smaller in comparison to the body the nearer man approaches to his full growth. In the second year the proportion of the brain to the body is as 1 : 14; in the third, 1 : 18; in the fifteenth, 1 : 24. In a full-grown man between the age of twenty and seventy years, as 1 : 35 to 45. In lean persons the proportion is often as 1 : 22 to 27; in stout persons as 1 : 50 to 100, and more. . . . The female brain is for the most part even larger than the male, compared with the size of the body."†

*. Broca, loc. cit., p. 19.

† Tiedemann, "On the Brain of the Negro, compared with that of the European and the Orang," 'Phil. Trans.,' 1836, vol. cxxvi, p. 503.

The observations of Drs. Reid and Peacock are 154 in number; and from these Dr. Peacock infers that "the relative proportion of the encephalon to the whole body undergoes a gradual decrease from infancy to adult age; and averages in males, at from twenty-five to fifty-five years of age, 1 to 37·2, presenting during this period a range of from 1 to 30 to 1 to 25, according to the state of emaciation or corpulence of the body. In females the average during adult life is 1 to 33·5, and the extremes 1 to 44·8 and 1 to 24. The female brain, though absolutely lighter than that of the male, maintains a higher proportion relatively to the weight of the body."*

Dr. Boyd's tables for St. Marylebone afford a very much more extensive basis for this inquiry, and I have extracted the average weights of the body and of the brain, for the periods above four years of age, and have calculated the proportions, which are here given.

Weight of Brain to Weight of Body.

Years.	Male.	Female.
4—7	1 : 10·1	1 : 9·5
7—14	1 : 14·7	1 : 15·
14—20	1 : 22·4	1 : 23·2
20—30	1 : 31·	1 : 31·8
30—40	1 : 32·5	1 : 32·3
40—50	1 : 34·1	1 : 31·6
50—60	1 : 34·4	1 : 32·
60—70	1 : 36·	1 : 31·8
70—80	1 · 37·3	1 : 31·1
80—90	1 : 35·	1 : 31·8
20—60	1 : 33·	1 : 31·9
60—90	1 : 36·1	1 : 31·5

The conclusions of Tiedemann, and of Peacock, are in some degree modified by this examination of Boyd's numbers, which show a somewhat higher ratio of the weight of the brain to that of the body, and for the period of maturity (from twenty to sixty years), give a considerably less difference in this ratio for the two sexes.† The brain-weight of the female is, however, still seen to be somewhat greater in proportion to the weight of the body than that of the male. Here I must observe that the weight of the brain may be conceived to have a certain relation to that of the body, so far as this depends on the size and development of the muscles; but can hardly have any to the degree of "leanness" and "stoutness," or "emaciation" and "corpulence," which principally depend on the

* Peacock, l. c., Tables X and XI, p. 24.

† Dr. Boyd's tables do not enable us to calculate the limits between which the ratios fluctuate. Maxima and minima are given for both the body-weight and the brain-weight, but only for one instance of each, and these are not necessarily in the same individual. It must be remembered that the greater number of these brains were probably those of persons dying from chronic diseases.

presence or absence of fat in the areolar tissue, the mean amount of which may be different in the two sexes.

Though it may be questioned whether many useful physiological inferences are to be deduced from the ratio of the brain-weight to that of the body in the two sexes, the comparison of the brain-weight with the stature may yield more valuable conclusions. The calculations of M. Parchappe were founded on nineteen examples. Nine of these (five men and four women) were of high stature, and ten (five of each sex) were of low. From the measures and brain-weights in these cases, M. Parchappe inferred that, other things being equal, the weight of the brain in both sexes is relatively greater in tall persons than in short ones, the difference between the two being at the rate of 5 per cent.; *i. e.* the brain of a tall man being represented by 100, that of a man of short stature was 95. The difference in women was a little less.*

Dr. Boyd's tables do not enable us to calculate the relation of high and low stature in the same sex to the weight of the brain, but only the relations of the average stature to the brain-weight in the two sexes. I have abstracted the numbers for the period of maturity, from twenty to sixty years, and have arranged them so as to show the ratio of stature to brain-weight, and have compared with this the ratio of the weight of the body and that of the brain at the same ages. There were 795 brains weighed at these ages; those of men being about 15 per cent. in excess of the other sex (Table IX). The weight of the entire body was ascertained in 755 cases, and the stature in 770. This slight disproportion in the numbers is not sufficient to disturb the averages. The mean brain-weight for the entire period, from twenty to sixty years, is shown in Tables VII and VIII, and is in the ratio of 1000 for the men to 903 for the women. The average weight of the body is 98·7 lbs. avoirdupois for the men, and 86·1 lbs. for the women; the ratio being as 1000 to 812. The average stature is 66·5 inches for the men, and 62 inches for the women; the ratio being as 1000 to 932. These results are brought out in the tabular views which follow:

Ratio of Weight of Body and of Weight of Brain compared.

Ages.	Average Weight of Body. Male. lbs. av.	Female. lbs. av.	Ratio of Weight of Body. Male.	Female.	Ratio of Weight of Brain. Male.	Female.
20—30	92·9	86·9	1000	934	1000	912
30—40	98·2	87·	1000	886	1000	894
40—50	102·	84·6	1000	843	1000	896
50—60	102·	86·	1000	832	1000	909
Average. 20—60 lb.	98·7	86·1	1000	872	1000	903
Average. 20—60 kil.	44·752	39·039				

* Parchappe, 'Sur l'Encéphale,' 1836, pp. 76, 101, 102; Broca, l. c., p. 13.

Ratio of Stature and of Weight of Brain compared.

Ages.	Average Stature. Male.	Female.	Ratio of Stature. Male.	Female.	Ratio of Weight of Brain. Male.	Female.
20—30	66·7	62·	1000	939	1000	912
30—40	66·5	62·	1000	932	1000	894
40—50	66·8	62·	1000	928	1000	896
50—60	66·	62·	1000	939	1000	909
Average. 20—60 Inches	66·5	62·	1000	932	1000	903
Metre	1·689	1·575				

We thus see that, according to these observations, the relations of the brain-weight to the stature in the two sexes are the reverse of those which it has to the mere weight of the body. Whilst the average weight of the brain in the female is greater by 3 per cent. than that of the male relatively to the average *weight of the body;* it is, by the same amount of 3 per cent., less than that of the male in relation to the *stature.*

IV. Race and Ethnological Characters.

The influence of race on the weight of the brain is no doubt considerable; but has hitherto been very partially investigated by actual weighings of that organ. The average weight of the encephalon may, perhaps, be regarded as ascertained for the English and Scotch, and with less precision for the French and Germans. All these, however, may be regarded as belonging to one great family, the so-called Indo-European, or Caucasian of Blumenbach; and though modern science may distinguish differing race-elements in these peoples, they are too much mixed to allow of the presumption of any material difference in the brain-weight. But some difference was probable, and is actually brought out in the tables before us (Tables VII, VIII). We will limit our attention to the first of these tables, that for the male sex, and to the period of life from twenty to sixty years, that of the mature man. I think it probable that Professor Welcker's estimate of 1390 grammes, or 49 oz., represents the mean weight of the male brain in Europeans generally for this period of life with sufficient accuracy; and if so, the separate peoples will range in the following order. Whether further inquiry will confirm this order is as yet doubtful; but a comparison of Tables V and VI, showing the brain-weights of the insane in the same peoples, seems to make this probable. Hitherto, no doubt, the brain-weights have been obtained from too restricted areas, and too much from one class of life. It is not at all unlikely that there may be a considerable difference in the brain-weight of the English, Scotch, French, and Germans, according to the county, department, or province to which they belong:—

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Ratio of Brain-weight of different European Peoples.

	Oz.	Grmm.	Ratio of Brain-weight.
Europeans (*Welcker*).....	49	1390	... 100
English (*Boyd*)	47·8	1354	... 97
„ (*Peacock*)	49·	1388	... 99
French* (*Parchappe*)	47·9	1358	... 98
Germans, &c. (*Wagner*) ...	48·3	1371	... 98·5
Scotch (*Peacock*)	50·	1417	... 102

It is in the case of human races much more distinguished from each other than for the most part are the peoples of modern Europe that we may look for a notable difference in the average weight of the brain. This question has been hitherto chiefly investigated by means of gauging the skulls of different races, and so recovering the probable weight of the brain by calculation. There can be no doubt that the average cubic capacity of the skull and the average brain-weight are, *cæteris paribus*, in direct proportion to each other. According to Welcker, the average capacity of the German male skull is 1450 cubic centimetres, or 88 cubic inches English, and this corresponds with an average weight of brain of 49 oz., or 1390 grammes.† One cubic centimetre of cranial capacity represents rather less than one gramme weight of brain, viz., ·96 grmm. Tiedemann,‡ in Germany, and Morton,§ in America, have both gauged a large series of the skulls of different races, in order to determine the relative size of the brain; and in general, their results are in accordance. They show that the European skull is, on the average, decidedly larger than that of the Negro and Malay, and somewhat larger than that of the Mongol and American. This is seen in the following tabular view, in which I have calculated the

* The only brain-weights I find for the French not insane ("a l'état normal") are those of M. Parchappe ('Sur l'Encéphale,' 1836, Table IX). Out of forty-seven brain-weights in this table, there are only sixteen for the ages between twenty and sixty years, so that the average given above, as regards the French, must be taken merely as provisional. It is, indeed, much below the probable weight. I have shown, from the large series of 357 skulls from the cemeteries of Paris, which have been gauged by M. Broca, that the probable mean capacity of the male French skull is 1502 cubic centimetres, or 91 inches English. This capacity corresponds with a brain-weight of 1435 grmm. or 50·6 oz., which exceeds that of the Scotch, but requires to be corrected by the weight of the dura mater and fluids. Morton's cranial capacity for the "English, &c.," of 94 inches, corresponds with a brain-weight still greater, viz., 1480 grains. 'Memoirs of Anthropological Society of London,' vol. i, 1865, p. 464.

† Welcker, loc. cit., p. 37, 140.

‡ Tiedemann, l. c., 'Phil. Trans.,' 1836; 'Das Hirn des Negers,' 1837. The tables of skulls in the separate work are expanded by many additional instances. I follow the figures as given by Welcker, p. 41, from Huschke.

§ Meigs, 'Catalogue of Human Crania,' 1857, p. 17; Nott and Gliddon, 'Types of Mankind,' 1854, p. 450. When the catalogue of the very large collection of crania made by Dr. J. Barnard Davis is published, we shall be able to speak with greater confidence of the cranial capacity of different races.

ratio. According to this, the male Negro skull has an average capacity scarcely if at all exceeding that of the European female, and in the other "lower" races the diminution approximates more or less to this ratio. Tiedemann's own figures show how far he erred when he asserts "that the cavity of the skull of the Negro in general is not smaller than that of the European."*

Ratio of Cubical Capacity of Skulls of different Races.

European, Male (*Welcker*)	100		
Do. Female „	90		
Male.			**Averages.**
European (*Tiedemann and Morton*) ...	100	.....	100·
Mongol (*Tiedemann* 46)	93	.....	93·5
„ (*Morton*)	94		
American (*Tiedemann*)	95	.....	94·
„ (*Morton* 18).....	93		
Negro (*Tiedemann* 54).....	91	.....	90·5
„ (*Morton* 64)	95		
Negro (*Peacock* 4)	88		
Hottentot (Morton 3)	86		
Malay (*Tiedemann* 98)	89	.....	91·
„ (*Morton*)	93		
Australian (*Morton* 8)	88	.....	85·
„ (*Peacock* 3).....	77		

The observations as to the actual weight of the Negro brain given by Tiedemann are five in number, all those of men; and the weight, so far as can be made out from the variety in the standard employed, varied between 35 and 49 oz., the average being 42·7 oz. avoirdupois, or 1210 grammes. In calculating the average weight of these five brain-weights, I have allowed 8 oz., or 23 per cent., for the loss of one of them by maceration in spirit.

My friend, Dr. Peacock, has lately published five weights of the brains of Negroes and two of Negresses. The observations are too few to justify definitive conclusions, but so far as they go, they decidedly confirm the results arrived at by gauging the skulls, or rather show a greater difference between the brain-weight of the Negro and that of the European. Dr. Peacock's weights for the five Negroes varied from 42·5 to 46·3 oz.; the mean weight being 44·3 oz., or 1255 grammes. Those of the two Negresses weighed 41 and 46 oz. respectively; average, 43·5 oz.†

* L. c., p. 511. Tiedemann did not calculate the averages of his figures; had he done so he must have detected his error. He evidently wrote under a strong predilection for the Negro race, and with the view of justifying, as he expresses it, "the situation in society which had so lately been given to the Negro by the noble British Government." It was possible for a physiologist to write thus in 1836; it would scarcely be so for any one, avoiding partisan extremes on both sides of this controverted political question, to do so in 1866.

† Peacock, "On the Weight of the Brain in the Negro," 'Memoirs of Anthropological Society of London,' vol. i, 1865, pp. 65, 520. The two Negresses' brains, on the average, equal the weight of those of European females; and it is a curious fact

Three brain-weights of Negroes have been published still more recently, by Professor Barkow, of Breslau. They vary between 50·8, 45·9, and 38·9 oz.; and average 44·5 oz., or 1261 grammes in weight.* The first of these is the *heaviest* Negro's brain yet recorded, but even this does not exceed the *average* weight of that of the Scotchman between twenty and forty years of age.

Average Brain-weight of Europeans and Negroes compared.

Males.	Oz.	Grmm.	Ratio of Brain-weight.
Europeans	49	1390	... 100
Negroes (*Tiedemann* 4)	44·2	1252	... 90
„ (*Peacock* 5)	44·3	1255	... 90
„ (*Barkow* 3)	44·5	1261	... 90
„ (*Average* 12)	44·3	1255	... 90

Altogether, the decided influence of race on the weight of the brain in the Negro is scarcely to be questioned; and there can be little doubt that the smaller size of the brain in other melanous and lower races, will hereafter be made out by direct observation. The brains of the Hindoo, Hottentot, Bushman, and Australian, are probably of less weight even than that of the Negro;† but in all these comparisons the stature must be considered.

V. SOCIAL POSITION AND EDUCATION.

The average weight of the brain of the educated, and of those who occupy a superior social position, is no doubt greater than that

that, according to Tiedemann, the twelve skulls of Negresses gauged by him rather exceeded in capacity that of twenty skulls of European women. We need further observations on this point.

* Barkow, 'Skelett und Gehirn Lehre,' 1865, s. 31, 46, 61. The ever-varying German weights are most troublesome; but, I believe, the equivalents are correctly given above. The German 'Med.-Gewicht' was in the first place reduced to oz. troy, by multiplying by ·960; the ounces were then converted into grains, and these again into ounces avoirdupois.

The weights of the brains of the four Negroes from Tiedemann in the above table are, I believe, correctly stated. The lightest must have weighed 40·25 oz. (and not "35" oz., as on the opposite page), when reduced from Nuremberg weight, and when the full allowance of 29 per cent., (11 oz.) is made for maceration in spirit. I omit the fifth brain ('Das Hirn des Negers,' p. 20), quoted from Mascagni, as, if not preserved in alcohol, it must have been quite microcephalous.

† The brain of the Bushwoman, so carefully and ably described by Professor John Marshall, F.R.S., is reported by him to have weighed 31·5 oz., or 893 grmm., or less than two thirds that of the average European female. The brain of the Bushwoman, known as the Hottentot Venus, was a very little larger. "On the Brain of a Bushwoman; and on the Brains of two Idiots, of European Descent;" 'Phil. Trans.,' 1864, vol. cliv, pp. 501, 508, 556. Dr. R. Quain gives the brain-weight of a Bosjes girl, aged 14, in height 40 inches, and who died of phthisis, as 34 oz., or 963 grmm. ('Pathol. Trans.' 1850, vol. ii, p. 182. This falls short even of the average weight of the brain of the female English child, between two and four years of age, in whom, according to the tables of Dr. Boyd, the brain-weight is 34·97 oz. (991 grmm.), and the average stature 31·6 inches. See Table IX, *post*; and 'Phil. Trans.,' vol. cli, p. 247.

of the uneducated and lower class. Materials for the numerical proof of this position are at present not available; and it is very desirable that a sufficient number of facts should be collected for its solution. It may, however, be remarked that the average brain-weight of the more educated middle class of the insane weighed by me at York (Tables III and IV), is, for men at the middle period of life, decidedly above that of paupers in the county asylums for Somerset and Wilts. M. Broca's researches on the dimensions of the heads of students of medicine, as compared with those of servants in the large hospital of the Bicêtre, show a decided preponderance in favour of the students. He considers it as "certain that, other things being equal, whether the result of education or whether hereditary, the volume of the skull, and consequently of the brain, is greater in the superior than in the inferior classes."*

VI. Morbid Conditions of the Brain—Insanity, Idiocy, &c.

Insanity.—A comparison of the average brain-weights observed in English asylums with those of persons unaffected by insanity seems to show distinctly that mental disorders, when fatal, are associated with a diminished brain-weight. This applies to both sexes and to all periods of life, but is especially apparent when the comparison is restricted to the male sex, and to persons of mature age, or from twenty to sixty years. A comparison of the Tables III, IV, V, and VI, with Tables VII and VIII, also shows that the average weight at successive ages differs less than in those unaffected by insanity. This is probably to be explained by the growth and development of the brain in those attacked before the middle period of life being arrested, and replaced by a tendency to premature atrophy of the brain. With the advance of age this atrophy, no doubt, progresses; though to what extent it is more potent in the aged insane than in the aged generally, we do not as yet know. Something may be due to the intellectual and social position of the insane in different asylums in producing this more uniform brain-weight at different ages. When, as in the counties of Somerset and Wilts,† the great majority belong to the peasant class, it may be inferred that the intellectual development proper to them, and with that the greatest weight of the brain, were attained at an earlier period of life than is the case in the educated and superior classes.

* Broca, "Sur la Capacité des Crânes Parisiens," 'Bull de la Soc. d'Anthrop.,' 1861, t. iii.

† It is not unimportant to observe that the low brain-weight of the insane of the pauper class of Wilts and Somerset is not peculiar to those counties, but seems to apply to the south-west of England generally. I have tabulated the 122 cases for Devonshire, published by Dr. Bucknill, and find the average weight at 20—60 years, to be 46 oz. (1303 grmm.), for men, and 43·5 oz. (1233 grmm.), for women. Reports of the brain-weights obtained for the insane in some of the asylums of the Northern and Eastern Counties are much to be desired.

Average Brain-weights of the Sane and Insane compared.

Males, 20—60 Years.	Oz.	Grmm.	Ratio of Brain-weight.
Sane (*Welcker*)	49	1390	... 100
„ (*Boyd*)	47·8	1354	... 97
Insane.			
Somerset.....	46·6	1320	... 95
Wilts	46·3	1312	... 94
York	48·7	1380	... 99
Averages	46·6	1019	... 95

Females, 20—60 Years.	Oz.	Grmm.	Ratio of Brain-weight.
Sane (*Welcker*)	44	1250	... 90
„ (*Boyd*)	43·1	1221	... 88
Insane.			
Somerset.....	43·2	1224	... 88
Wilts	41·1	1164	... 84
York	43·1	1221	... 88
Averages.....	42·4	1201	... 86

If this comparison of the brain-weights of the insane with those of Europeans generally, as determined by Welcker, be a just one, it would result that the average effect of mental alienation is to reduce the brain-weight by about 5 per cent. It may, however, be more correct to make the comparison with the brain-weights of a population nearly on a level in mental culture with that of the peasantry of Wilts and Somerset, and such as is perhaps afforded by Dr. Boyd's weights derived from the patients in the St. Marylebone parochial infirmary.* As shown in the above tabular view, the difference for the men is reduced by almost exactly one half, and stands at 2·5, in place of 5 per cent.

It has sometimes been maintained that insanity has the effect, not of diminishing, but of increasing the weight of the brain. This was at one time the opinion maintained by M. Parchappe,† though founded on the brain-weights of no more than forty-seven insane persons, of whom rather more than half were men. The mean increase in the brain-weight of the insane was computed by him at 5 per cent. In his second memoir, however, which is founded on a greater number of cases, he shows distinctly that in chronic insanity

* The weights of the brain obtained at the St. Marylebone Infirmary by Dr. Sims, several years before those by Dr. Boyd, give, when analysed, precisely the same average of 47·8 oz. for men between 20 and 60 years, as the much larger series by the later observer. Sims's weights for women, at the same period of life, are heavier than those of Dr. Boyd, by 1½ oz. (42·5 grmm.), and average 44·6 oz. (Peacock, *l. c.*, p. 19.)

† Parchappe, 'Recherches sur l'Encéphale, Prem. Mémoire,' 1836, pp. 77, 101, 102. Though not reasserted, I am not aware that this opinion, in regard to *the brain-weight of the insane in general*, has been retracted by M. Parchappe.

and likewise in insanity complicated with paralysis, constituting a very great majority of his cases, the mean weight of the brain is more or less decidedly inferior to that of the encephalon in its healthy state.* It is, moreover, probable that M. Parchappe's standard of 1352 (or 1358) grammes, as the average brain-weight of the healthy Frenchman, is much less than the true mean. The average brain-weight which, after Welcker, is assumed in this paper as that of the male European, is 1390 grammes; and Drs. Reid and Peacock's weights give 1417 grammes as that of the Scotch. The mean weight for the French, as M. Broca's cubic capacities of their skulls make probable, may be nearly as much.

In a third treatise † M. Parchappe, having more than doubled the number of his observations, again publishes the brain-weights of the insane collected by him at the asylum of St. Yon, near Rouen. These weights, still somewhat restricted in number, I have abstracted and given a place in Tables V and VI. We here see that the average weight for the insane male, at 20—60 years, exceeds by 25 grammes, or nine-tenths of an ounce, that which he assumed as the mean healthy weight, whilst that for the insane female falls short of his healthy standard by almost as much. One table, given by M. Parchappe, is of great interest. In it he arranges the brain-weights according to the form and duration of the mental disorder at the time of death, under the heads of acute and chronic mania, the latter being divided into four categories, according to the degradation of the intelligence. The average weight of the male brain in acute mania is stated as 1449 grammes, and that in chronic mania as 1363 grammes; the latter descending under its four subdivisions from 1402 to 1395, 1374 and 1297 grammes respectively.‡ The distinguished author adds—"The law of the gradual diminution of the brain in uncomplicated mania, in accordance with the successive degradation of intelligence, is, I think, placed beyond doubt by the facts I have observed."

The diminished mean weight of the encephalon in the insane who die in asylums doubtless depends on atrophy of the convolutions, the frequency of which in chronic insanity was first particularly insisted on by the very distinguished pathologist whose works I

* Parchappe, 'Recherches sur l'Encéphale, Deuxième Mémoire,' 1838, pp. 144, 181, 186.

† Parchappe, 'Traité de la Folie,' 1841, pp. 345—350.

‡ In 'Brit. and For. Med.-Chir. Review,' Jan. 1865, vol. xxvv, p. 219, and in 'Journ. Mental Science,' Jan. 1865, vol. x, p. 512, Dr. Boyd gives papers and tables on the brain-weight of the insane as observed by him in the Somerset Co. Asylum, in which the weight, as influenced by the different forms of insanity, is treated. The greatest average weight was, for men, in mania; and, for women, in epilepsy, combined with idiocy. From the former of these papers we must regret the absence of the extended tables to which it refers. What we require to know, as regards the brain-weight, is not the form of insanity when the patient was brought under care, but that which existed at the time of death.

have here quoted. Our knowledge of this morbid condition has been very materially advanced by the admirable researches of Dr. Bucknill, who, by an ingenious method which he has described, estimated numerically the amount of the atrophy.* In 64 fatal cases of insanity of all descriptions, in both sexes and of all ages, Dr. Bucknill found, by direct experiment, that the average amount of atrophy equalled "five ounces and a quarter (148 grammes), varying from nothing to fifteen ounces, or one third of the whole cerebral mass. In thirteen patients whose ages exceeded sixty-five years the average amount of atrophy was eight ounces and one sixth, or more than 50 per cent. above that of the whole number. The amount in epileptic cases was greatly below the average of the whole." The greater exemption from atrophy of the brain in cases complicated with epilepsy, is also shown by M. Parchappe, whose heaviest brain-weights are those of epileptics, the next in order being in recent acute mania.

It is evident that the average brain-weight of those dying in asylums is made up of weights which are above the average of the healthy brain, and of others which are materially below it. Though in general the latter greatly predominate, the difference in the mean weight obtained by different observers may still result from a difference in the proportion in which brains above and brains below the average weight are met with. It is well known that the general paresis of the insane occurs with very different degrees of frequency in different asylums; and it is by no means improbable that the proportion of cases of fatal acute mania, of mania complicated with epilepsy, and of chronic mania, may materially differ in different countries, and even in different districts of the same country. For an acurate comparison of the brain-weights of the insane it will be essential that the character, complications, and duration of the mental disorder should be known.

Some observations of the weight of the brain in cases of insanity give averages so much above those generally observed as to deserve consideration. Dr. Skae, in 1854, compared the brain-weights which, up to that time, he had collected at the Royal Edinburgh Asylum, with those for the sane, collected by Drs. Reid and Peacock at the Royal Infirmary of Edinburgh.† From this comparison Dr. Skae inferred "that the average weight of the brain is increased in persons dying insane; the average weight in the insane (males), from fifteen to ninety years of age, being 50 oz. 2 dr., and in the sane 49 oz. 14 dr." I have been at the labour of extracting and classifying the brain-weights given by Dr. Skae in his annual reports for

* Bucknill, "Pathology of Insanity," 'Brit. and For. Med.-Chir Review,' 1855, v. xv, p. 207; Bucknill and Tuke, 'Psychol. Medicine,' 2nd ed., 1862, p. 419.

† 'Edin. Monthly Journ. of Med. Science,' Oct. 1854, p. 289.; 'Annual Report of Royal Edinburgh Asylum for 1854.' Appendix, p. viii.

the ten years from 1855 to 1864; and have thus increased the numbers analysed by him in 1854, from 199 to 560 cases. These, which are inserted in their proper places in Tables V and VI, show very nearly equally high figures with those originally given by Dr. Skae. On comparison, however, with the brain-weights of Scotchmen not affected by insanity, given in Tables VII and VIII, from Drs. Reid and Peacock's tables, no material difference is to be observed in the weights for the two classes of men; but as regards the women, the weight for the insane, from twenty to sixty years of age (45·9 oz., or 1300 gramm.), actually exceeds that for the sane by the considerable amount of one ounce, or 28·3 grammes. This result is certainly surprising; the brain-weights of the two classes, sane and insane, being for the most part derived from the same somewhat limited area of the Scottish capital and lowlands. It may, however, be presumed that the proportion of the educated and higher class was greater among the insane whose brains are compared.

Dr. Skae concludes that the greater average weight of the encephalon observed by him depends chiefly on *an increase in the weight of the cerebellum*. That the average weight of the cerebellum is somewhat greater in the insane than in the sane I believe to be proved by the facts hitherto collected. I have not gone into this question so fully as may be desirable; but the following comparison of the average weight of this organ (including the pons and medulla), in the two classes of sane and insane, for the male sex and the middle period of life, may be introduced here, and is not without interest.

Average Weight of the Cerebellum in the Sane and Insane.

Men, 20—60 years.

Sane.	Oz.	Grmm.		Insane.	Oz.	Grmm.		Excess. Oz.	Grm.
St. Marylebone (*Boyd*)	6·16	174	...	Somerset (*Boyd*).....	6·39	181	...	·23	7
				Wilts (*Thurnam*).....	6·75	191	...	·59	17
Edinburgh (*Peacock*)	6·29	178	...	Edinburgh (*Skae*).....	6·55	185	...	·26	7
Averages	6·22	176			6·56	185	...	·36	10

The difference, it will be seen, ranges between ·23 and ·59 of an ounce, or between 7 and 17 grammes; which is scarcely sufficient to explain any increase in the weight of the brain as a whole. It may be inferred, however, that the cerebellum is not, like the cerebrum, liable to atrophy in chronic insanity, or at least not to the same extent.

The only series of brain-weights for insane Germans with which I am acquainted is that by Dr. Bergmann, of the asylum at Hildesheim, in Hanover. These weights, like those of Dr. Skae, are unusually heavy, as is seen on comparing them with those fixed on

by Welcker for the northern Germans in general. The weights for aged men, from sixty to eighty years, are unprecedented, whether for the sane or the insane. The data, however, are too restricted to inspire confidence. I have given the facts as I find them, translating only, by the aid of Wagner's table, the weights from German into avoirdupois ounces.

The *specific gravity* of the brain has, by recent researches, been shown to be greater in the insane than in the sane; though the difference, on the whole, appears to be limited to the gray matter. I take the following figures from the excellent paper by Dr. Charlton Bastian on this subject.*

Average Specific Gravity of Gray Matter.

Sane.			Insane.	
Bastian	1·0300	.....	Bastian	1·0325
			Bucknill.....	1·037
Sankey	1·0346	.....	Skae	1·0391
Averages...	1·0323			1·0362

Average Specific Gravity of White Matter.

Sane.			Insane.	
Bastian	1·0404	.....	Bastian	1·0405
			Bucknill.....	1·0390
Sankey	1·0412	.....	Skae	1·0424
Averages...	1·0408			1·0406

It has been suggested by M. Parchappe, and also by Dr. Skae, that an increased weight of the brain in insanity might be connected with the increase in the specific gravity. The difference, however, is not adequate to explain such a result, except to a very small degree. Taking even the extreme numbers given above, and assuming that a brain of 50 ounces, or 1417 grmm., consists of gray and white matter in equal proportions, it will be found that the increase in the specific gravity would allow for an increase in the weight of less than a quarter (·2245) of an ounce, or 6·35 grmm. It would appear, from Dr. Skae, that the highest specific gravity is in cases complicated with epilepsy. As a general rule, Dr. Bucknill observes, "The conditions which favour a high specific gravity are congestion and induration; those which favour a low one are œdema and fatty degeneration. A watery or œdematous condition of the brain is frequently met with in dementia and chronic insanity generally, and in such cases the specific gravity is low."†

* Bastian, "On the Specific Gravity of the Brain," 'Journal of Mental Science,' 1866, vol. xi, p. 465. Dr. Bastian's researches afford grounds for doubting whether the true average specific gravity of the gray matter in the insane has yet been ascertained.

† Bucknill, 'Psychol. Medicine,' 1862, p. 486.

Congenital Idiocy and Imbecility.—These conditions have, no doubt, a greater influence in reducing the average weight of the brain than chronic insanity properly so called. The diminution connected with idiocy was estimated by M. Parchappe at 18 per cent.; but it is highly probable that it is much greater. Materials, however, are as yet wanting to enable us to determine this question satisfactorily. Microcephaly is a common condition in the congenitally idiotic and imbecile; though in not a few of these unfortunates, the head is of good size and fair proportions. On the other hand, it must be remembered that dementia and acquired imbecility have frequently been confounded with true idiocy. It would be desirable if for the future the brain-weights of idiots were kept apart from those of the insane proper; but this, so far as I know, has been done only by M. Parchappe. There is, indeed, some difficulty in such a method, as many partially idiotic and imbecile persons are attacked with mania later in life, and are sent to asylums, not on account of the original defect, but on that of the mental disorder supervening upon it. Out of the 527 brains weighed at the Somerset County Asylum by Dr. Boyd, thirty-two are classed as those of idiots, as follows:

Brains of Idiots, Somerset County Asylum, 1848—1860.

	Male.	Female.	M. and F.
Idiocy	5	6	11
Idiocy with epilepsy	15	6	21
Totals	20	12	32

The weights of the brain in these cases is not separately given. Out of the 470 brains weighed at the Wilts County Asylum, there were twenty-two which may be regarded as those of idiots and imbeciles. Half of each sex were epileptic. Two of the male and one of the female sex were less than twenty years of age; the ages of the former varying from sixteen to fifty-two, and those of the latter from nine to forty-five years.

Brains of Idiots, Wilts County Asylum, 1851—1864.

	Male.	Female.	M. and F.
Idiocy and imbecility	7	4	11
Idiocy and imbecility with epilepsy	7	4	11
	14	8	22

The average weight of the fourteen male brains was 42 oz., or 1190 grammes; that of the eight female, 41·2 oz., or 1167 grmm. The average of these latter is almost identical with that of the rest of the female insane of the same series; but that of the male brains is very decidedly less, and nearly approximates to the proportion indicated by M. Parchappe.

Ratio of Brain-weight of the Sane and of Idiots compared.

	Male.	Female.
Sane	100	90
Idiots (*Wilts Co. Asylum*).....	84	82

These numbers, founded, as they are, on cases complicated with epilepsy,* may not, perhaps, be accepted as expressing the true ratio of the average weight of the brains of idiots; for determining which an extended series of classified observations, such as we may hope will be made by Dr. Down, the physician of the Idiot Asylum at Earlswood, is required.

VII. MICROCEPHALY AND MEGALOCEPHALY.

Any considerable series of brains, as also skulls, may be divided into those in which the weight of the brain, or capacity of the skull, greatly exceeds, on the one hand, or greatly falls short of, on the other, the average standard. In Table X, I have arranged the brain-weights obtained by me at the Wilts County Asylum, so as to show the numbers in which such excess or diminution existed; and, in the absence of other weights more suitable for the purpose, I have compared with them all the brain-weights of adults (twenty to ninety years), contained in the great table of Wagner. In the centre of the table are the *brains of medium size*, forming the great majority of the whole, viz., those of men weighing from 40 oz. (1130 grmm.) to 52½ oz. (1490 grmm.), and those of women weighing from 35 oz. (990 grmm.) to 47½ oz. (1345 grmm.); the range between the maxima and minima of these weights being one of 12·5 oz., or 355 grmm. Above these are placed the *megalocephalous*,† or great brains (sub-

* M. Parchappe has published the brain-weights of five male idiots and one female. ('Traité de la Folie,' p. 366-72). Two of the male sex were likewise epileptic; the weights varied between 970 and 1320, and had an average of 1141, grmm., or 40·2 oz.; being only a little less than those observed by myself. The brain of the female idiot weighed 720 grmm., or 25·4 oz.

Since the above was written Dr. Down has favoured me with a summary of the brain-weights in the 50 cases most recently examined by him; in which for the two sexes, 5—33 years, the average was 42·75 oz., or 1211 grmm.; being a little more than that observed by myself. The minimum weight, in a boy of 18, was 15 oz. (425 grmm.); the maximum, in a man of 22, was 59·5 oz. (1404 grmm.), or more than that of Whewell. Weight or *quantity* of the brain is not everything.

† I here substitute the term *megalocephalous*, introduced by Professor Lucae, for that of *macrocephalous*, as employed by Virchow in the same signification. The latter might, perhaps, have been the better for our language, had it not been applied by Hippocrates to the distorted long-heads of a people near the Caucasus; and had not modern craniologists, after the example of Von Baer, generally agreed to apply it to the skulls supposed to be those of the people described by the Father of Medicine. Virchow and Lucae agree in dividing their *macrocephaly* and *megalocephaly* into water-heads and great-heads,—*hydrocephaly* and *kephalones*. It is with the brains of these last that we are here concerned. Welcker was the first to lay down a standard for judging of the commencement of kephalony.

divided into two classes), in determining the standard for which I have followed Professor Welcker. "Skulls of more than 540 to 550 millemetres in horizontal circumference (the weight of brain belonging to which is 1490 to 1560 grmm. (52·5—55 oz. avoirdupois), are to be regarded as exceptionally large. The designation of *kephalones*, proposed by Virchow, might commence from this point. Men with great mental endowments fall, for the most part, under the definition of kephalony. If we consider the relations of capacity, 1800 grmm. (63·5 oz.) appears to be the greatest attainable weight of brain within a skull not pathologically enlarged."* Welcker does not give a standard for kephalony in the female, which I supply by deducting about one tenth, five ounces (142 grmm.), or the difference between the average weight of the male and female brain, from the standard of male megalocephaly.

Microcephaly.—Neither has Professor Welcker indicated any standard for the *microcephalous* brain; but we may assume such a standard as the numerical reverse of the megalocephalic, and as much below the average medium weight as that is above it. The results which I have obtained, as regards microcephaly, tally very closely, as I have since observed, with those arrived at by M. Broca, from his analysis of Professor Wagner's table. "It is certain that below a particular limit of weight an intelligent human brain no longer remains. Professor Gratiolet fixed this limit at 900 grmm. (31·75 oz.), but without specifying the sex;" and M. Broca somewhat extends this limit when he fixes on 907 grmm., or 32 oz., as the limit for the female, and 1049 grmm., or 37 oz., as that for the normal male brain.† My numbers, deduced by a different method for extreme microcephaly, at which, as a rule, idiocy may be supposed to commence, are very nearly the same.

Estimated Brain-weight in the Microcephaly of Idiots.

	Male.			Female.	
	Oz.	Grmm.		Oz.	Grmm.
Broca	37·	1049	.....	32·	907
Thurnam	37·5	1062	.....	32·5	920
Difference	·5	13		·5	13

In estimating the weights of brains classed in the table as microcephalic we must distinguish those which owe their small weight in great measure to the atrophy of disease rather than to original

* Welcker, 'Wachsthum und Bau, des Menschlichen Schädels,' p. 140, comp. pp. 38—40.

† Broca, 'Sur le Volume et La Forme du Cerveau,' loc. cit., p. 22.

defect. This it is seldom easy to do with tabular statements, as the data are rarely minute enough to enable us to distinguish the one from the other. Out of the ten men observed by me with brains of a less weight than 37·5 oz., only five were congenital idiots or imbeciles, and in these the average weight was 35·2 oz., or 997 grmm. The others were four of them cases of dementia and one of epilepsy, and were all married men. Of the five women whose brains did not exceed 32·5 oz. not one was classed as a congenital imbecile or idiot. The cases were those of mania, melancholia, or dementia complicated with epilepsy or paralysis; three of them were married.

The microcephaly associated with idiotism has frequently been much more extreme than in any case embraced by the tables before us; and brains of idiots have been met with weighing as little as 21, 10, and even 8·5 oz., or 600, 283, and 241 grmm. It may be useful to collect here a few of the less marked cases which have fallen under my own observation, and to add to these some of a more marked character, which have been reported by others.

Brains of Microcephalous Idiots,—Males.

No.	Observer.	Age.		Weight of Brain. Oz.	Grmm.
1.	Thurnam, *York*, 482*	29	.....	35·75	1013
2.	„ *Wilts Co. A.*, 428 ...	22	.....	35·5	1006
3.	Parchappe, 325†	45	.....	34·2	970
4.	Thurnam, *Wilts Co. A.*, 581...	52	.....	32·	907
5.	Peacock‡	11	.....	21·2	600
6.	Down, *Earlswood Idiot A.* ...	18	.....	15·	425
7.	Owen§	22	.....	13·125	372
8.	Theile‖	26·	.....	10·6	300
9.	Marshall¶	12	.....	8·5	241
	Average			22·87	648

* Thurnam. The frontal portion of the falx major was absent, and the frontal lobes were invested in a common covering of pia mater and arachnoid. In Dr. Peacock's case (No. 5), the anterior portion of the falx was likewise deficient.

† Parchappe, 'Traité de la Folie,' pp. 368, 371.

‡ 'Trans. Pathol. Soc. Lond.,' 1859, vol. x, p. 15.

§ 'Trans. Zool. Soc.,' vol. i, p. 343. Mus. St. Barth. Hosp., A, 123. In this case Professor Owen observes, "Nature may be said to have performed for us the experiment of arresting the development of the brain, almost exactly at the size which it attains in the chimpanzee, and where the intellectual faculties were scarcely more developed. Yet no anatomist would hesitate in at once referring the cranium to the human species." Vogt refines on this opinion. Eng. ed., pp. 145, 198.

‖ Wagner, 'Vorstudien,' ii, 3, 19.

¶ 'Phil. Trans.' 1864, vol. cliv, p. 526. 'Anthrop. Review,' 1863, vol. i, p. viii.

Brains of Microcephalous Idiots,—Females.

No.	Observer.	Age.		Weight of Brain. Oz.	Grmm.
1.	Bucknill, *Devon Co. A.*, 155*	37	.....	32·5	921
2.	Sims, 45†	12	.....	27·	765
3.	Parchappe, 327‡	25	.....	25·4	720
4.	Tuke, *York*, 372§	70	.....	22·75	644
5.	Tiedemann‖	16	.....	19·9	563
6.	Gore¶	42	.....	10·	283
	Average			22·9	649

The last three cases, reported by Herr Theile, by my friend Mr. Gore, and by Professor Marshall, in which the brain weighed little more, or even considerably less, than 10 oz. (300, 283, down to 241 grammes), are among the curiosities of medicine and physiology. The wonder is that even the vital processes could have been carried on so long as they were with a central organ of the nervous system in so minimized a condition. Wagner regarded microcephaly as "belonging to a pathological development series, which occupies an intermediate place between anencephaly and hydrocephaly." His concluding inference is as follows: "The relation of the lobes of the cerebrum to intelligence may, perhaps, be expressed thus: there is a certain development of the mass of the cerebrum, especially of the convolutions, requisite in order to such a development of intelligence as divides man from animals."**

In microcephalous idiocy the brain-weight is not only very low absolutely, but the relative amount of brain to body is extraordinarily diminished. Thus, in the case of the two lightest human brains yet recorded, those of the two idiots so accurately described by Professor Marshall, the proportion of brain to body was only as 1 : 140 in the woman, and as 1 : 67 in the boy; in place of 1 : 33 and 1 : 14 respectively, as, judging from Dr. Boyd's tables, are the normal proportions. The ratio of brain to body being far greater in the growing individual than in the adult, the female idiot's brain, though considerably heavier than the boy's, was, when thus tested, comparatively only a little heavier, "the proportion of brain to body in both being somewhat less than one fourth of what it

* 'Brit. and For. Med.-Chir. Rev.,' 1855, vol. xv, p. 216.
† Sims, 'Med.-Chir. Trans.,' vol. xix, p. 353.
‡ Parchappe, 'Traite de la Folie,' pp. 368, 371.
§ Dr. D. H. Tuke has reported the examination of the brain of this idiot, who for many years was under my care and observation. Tuke and Bucknill, 'Psychol. Medicine,' ed. 2, 1862, p. 96.
‖ 'Phil. Trans.,' 1836, vol. cxxvi, p. 502.
¶ 'Anthrop. Review,' 1863, vol. i, p. 168. 'Phil. Trans.,' 1864, vol. cliv, p. 525.
** Wagner, "Vorstudien," ii, 'Ueber den Hirnbau der Mikrocephalen,' p. 83.

would have been at corresponding ages in health. * * * In each, the deficiency in cerebral mass was greater than in cerebellar; the idiot boy had more cerebellum than the idiot woman; the idiot woman had more cerebrum than the idiot boy."*

Megalocephaly.—Referring to the male brain-weights in Table X, which transcend the medium size, and which exceed 52·5 oz., or 1490 grammes, we find that about 10 per cent. of the male and about 7 per cent. of the female cases observed in the Wilts County Asylum are thus classed. Of the decidedly megalocephalous weights there are between 3 and 4 per cent. It will not surprise us that in the cases from the table of Wagner, consisting of a large majority of the encephala of the sane, the proportion of microcephaly is smaller than in the asylum cases, and that of megalocephaly very much larger, or more than double for the two sexes taken together. Many of Wagner's cases are, no doubt, picked ones; and included in them are some of those of professors and other eminent persons.

Out of the brains weighed by me there are, as shown in this table, those of ten men and seven women which fall into the class of Decided Megalocephaly, as follows:

Decidedly Megalocephalous Brains of the Insane, Wilts Co. Asylum.

Male.—55 oz. or 1560 grmm. and upwards.						Female.—50 oz. or 1417 grmm. and upwards.				
No.	Age.		Oz.	Grmm.		No.	Age.		Oz.	Grmm.
1 E.†	53	...	55	1560	.....	1.	19	...	50	1417
2 E.	35	...	55·5	1573	.....	2.	43	...	50	1417
3.	50	...	55·5	1573	.....	3.	47	...	51	1445
4.	55	...	55·5	1573	.....	4.	50	...	51·25	1452
5.	47	...	56·75	1608	.....	5.	55	...	51·5	1460
6.	28	...	57·25	1622	.....	6.	62	...	51·5	1460
7 E.	27	...	57·5	1629	.....	7.	80	...	53·25	1509
8.	57	...	58·5	1658						
9.	47	...	59·	1672						
10 E.	26	...	62·	1760						
Average			57·2	1623		Average			51·2	1451

Dr. Boyd's tables do not enable us to say how many megalocephalous brains were observed by him, but the maximum weights, most of which fall within the class of decided megalocephaly, are given for the several ages.

* Marshall, l. c., 'Phil. Trans.,' 1864, pp. 528, 529.

† In the four cases distinguished by the letter E, Nos. 1, 2, 7, and 10, the patient suffered from epilepsy, which was the cause of death in all the cases.

Maximum Brain-weights. (*Boyd.*)

	Sane.—St. Marylebone.					Insane.—Somerset Co. Asylum.			
	Male.		Female.			Male.		Female.	
Age.	Oz.	Grmm.	Oz.	Grmm.		Oz.	Grmm.	Oz.	Grmm.
7—14	57·25	1622	52·	1473	.....	.	.	.	.
14—20	58·5	1658	52·	1473	.....	.	.	.	.
20—30	57·	1615	55·25	1565	.....	58·	1643	55·75	1580
30—40	60·75	1721	53·	1502	.....	57·5	1629	55·75	1580
40—50	60·	1700	52·5	1488	.....	57·75	1636	51·25	1452
50—60	59·	1672	52·5	1488	.....	56·	1587	51·75	1466
60—70	59·5	1686	54·	1530	.....	58·75	1665	48·25	1367
70—80	55·25	1565	49·5	1403	.....	55·	1558	48·	1360
80—	53·75	1523	48·	1360	.....	49·75	1410	44·5	1261
All Ages. 7—80	60·75	1721	55·25	1565	.....	58·75	1665	55·75	1580

The large brains above reviewed are, with little exception, those of persons in the labouring or artisan class, and if in any of them there was an unusual degree of intelligence the sphere for its exercise must have been very limited. The heaviest brain weighed by me (62 oz., or 1760 grmm.) was that of an uneducated butcher (No. 373), who was just able to read, and who died suddenly of epilepsy combined with mania, after about a year's illness. The head was large, but well formed; the brain of normal consistence, the *puncta vasculosa* numerous. Epilepsy is often connected with an unusually large brain, and in four out of the ten decidedly megalocephalous brains, weighed by me or by my assistants, the patient was epileptic. The heaviest brain-weight recorded by Dr. Bucknill (No. 160), is that of a male epileptic, aged thirty-seven; and in this instance the brain weighed 64·5 oz., or 1830 grmm., which was the weight of the brain of the celebrated Cuvier. With one exception, the maximum weight observed by M. Parchappe (No. 263), was also that of an epileptic man, aged thirty-one, in whose case the brain weighed 61·3 oz., or 1737 grmm. The heaviest female brain of which I find any mention is recorded by Dr. Skae. The patient was not epileptic, but laboured under monomania of pride, dying at the age of thirty-nine, of an exhausting disease, phthisis. The brain had, for a woman, the monstrous weight of 61·5 oz., or 1743 grmm. In Dr. Peacock's tables, out of the 157 weights of the brains of adult Scotchmen, between twenty and sixty years of age, there are four in which this ranged from 61 to 62·75 oz., or from 1728 to 1778 grmm. They were all apparently of the artisan class; the occupation of three of them being those of sailor, printer, and tailor respectively. The causes of death were fever, delirium tremens, and, in two cases, severe compound fracture. All were cases more or less liable to be attended with cerebral congestion; and there is nothing to show that these individuals were distinguished from their fellows

by superior endowments. In estimating exceptionally large or exceptionally small brains, the weight should always be considered in relation to that of the body, and, if possible, to the stature likewise.* Many of these large-brained artisans and labourers were, no doubt, men of proportionately large frames; tall, perhaps, and with well-nourished muscular bodies. Unfortunately, in one only of the cases before us is the weight of the body recorded, namely, in the sailor aged twenty-three years (No. 23 in Dr. Peacock's Table I), in whom it amounted to 135 lbs. (61·211 kilogrammes), being 45 per cent. above Dr. Boyd's average for that period of life, which is 92·9 lbs. The proportion of the brain-weight to that of the body is as 1 : 35·3, being decidedly less than that shown on a previous page to be the mean proportion, and which, for this decade of life, is 1 : 31. In the educated and intellectual class the reverse of this, as is notorious, is often the case. The philosopher Kant, as Carus has observed, had a head not absolutely large, though in proportion to the small and puny body of this eminent thinker it was of remarkable size. The same observation may be made as to the heads of well-known eminent men, statesmen and others, still living in England.

Professor Welcker has already been quoted for the opinion that 1800 grammes (64·5 oz.), is the greatest attainable weight of brain within a skull not pathologically enlarged. This opinion appears to be confirmed by experience. The celebrated Cuvier had a brain of 1830 grammes,† but he is said to have suffered from hydrocephalus when young. I have quoted above the brain of an epileptic of the same weight; but it is clear that the congested and abnormally heavy brains of epileptics must be excluded from this comparison. The encephala of many great men have been justly assumed very much to exceed the standard. Such are those of Cromwell, Pascal, Byron, and Napoleon I; but of their precise size or weight, we cannot speak with certainty. Next to the brain of Cuvier, will stand that of the distinguished physician of Edinburgh, Dr. Abercrombie, weighing 63 oz., or 1785 grammes.‡ After it, at a considerable interval, comes that of Spurzheim; then the brains of the celebrated mathematician of Gottingen, Dirichlet, and of the Duc de Morny, each weighing 1520 grammes; then those of the American

* The observations of Professor James Forbes, read to the Royal Society of Edinburgh, and printed in the English edition of Quetelet "On Man," 1842, p. 113, give both a heavier average weight and higher stature to the Scotch, than to the English.

† I follow M. P. Broca ("Sur le Volume du Cerveau," &c., 'Bull. de la Soc. d'Anthrop.,' t. ii), in giving the weight of Cuvier's brain as 1830 ("1829·96"), and not 1861 grammes, as it appears in the great table of Wagner; in which, even when thus corrected, it will still stand as the heaviest healthy brain. The difference between the two weights is 1·3 oz., or 31 grammes.

‡ As reported by Professor Goodsir, 'Edin. Med. Surg. Journ.,' 1845, vol. lxiii, p. 231. For the brain of Spurzheim, see 'Phrenol. Journ.,' ix, 567.

statesman, Daniel Webster; the Lord Chancellor Campbell,* and the celebrated divine, Dr. Chalmers;† to be followed by those of professors in the University of Gottingen,‡ whose names are less familiar to us in England, but with which that of the celebrated surgeon Dupuytren,§ and that of the well-known physiologist Tiedemann are associated, as having a similar rank in regard to weight. These I have collected in the following table, as affording the best data within our reach for an approximate numerical estimate of the brain-weight of the intellectual and cultivated as distinguished from that of the average man:

Brain-weights of Distinguished Men.

	Ages.	Oz.	Grmm.	Ratio.
1. Cuvier, *Naturalist*	63	64·5	1830	113
2. Abercrombie, *Physician*	64	63·	1785	128
3. Spurzheim, *Physician*	56	55·06	1559	112
4. Dirichlet, *Mathematician*	54	53·6	1520	109
5. De Morny, *Statesman and Courtier*	50	53·6	1520	109
6. Daniel Webster, *Statesman*	70	53·5	1516	109
7. Campbell, *Lord Chancellor*	80	53·5	1516	109
8. Chalmers, *Celebrated Preacher*	67	53·	1502	108
9. Fuchs, *Pathologist*	52	52·9	1499	107
10. Gauss, *Mathematician*	78	52·6	1492	107
11. Dupuytren, *Surgeon*	58	50·7	1436	103
12. Whewell, *Philosopher*	71	49·	1390	100
13. Hermann, *Philologist*	51	47·9	1358	97
14. Tiedemann, *Physiologist*	80	44·2	1254	90
15. Hausmann, *Mineralogist*	77	43·2	1226	88
Average of ten distinguished men	50—70	54·7	1552	111
Average of fifteen ‖ distinguished men	50—80	52·7	1493	107

When we examine this table, we find that, with five exceptions, three being those of aged men, the brain-weights fall within the limits I have assigned to megalocephaly; and, altogether, that they decidedly confirm the generally received view of the connection between size of brain and mental power and intelligence. If the examination of the brain in the upper ranks, and in men whose

* The brain-weight of the Lord Chancellor Campbell I take from the report by Mr. Acton ('Lancet,' Aug., 1861, ii, 193); that of the Duc de Morny from the newspapers, as confirmed by a distinguished anthropologist of Paris.

† See, for the brain of Chalmers, Dr. Begbie, in 'Edin. Monthly Journ. Med.,' vol. xii, p. 202, March, 1851; and the unsatisfactory article on the brain of Daniel Webster, 'Edin. Med. Surg. Journ.,' April, 1853, vol. lxxix, p. 355.

‡ For the brain-weights of the Gottingen professors, and for that of Tiedemann, see Wagner, 'Vorstudien des Menschlichen Gehirns,' I, 33; II, 93. Bischoff expressly names the atrophy of Tiedemann's brain. Welcker, 'Zwei Difform,' p. 12.

§ I take the weight assigned to the brain of Dupuytren in the 'Lancette Française,' 1835, No. 20, and which is generally received in Paris; but according to other reports, and as from his portraits one might readily believe, it was much heavier. (Wagner, 'Vorstudien,' i, p. 96, 'Northern Journ. Med.,' x, Feb., 1845.)

‖ As this is passing through the press, the brain-weight of an English

mental endowments are well known, was more often allowed, this connection, there can be little doubt, would rest on more extended evidence than at present. Omitting from the estimate the encephala of four octogenarians, some of which were more or less reduced by senile atrophy, there remain ten brain-weights with an average of 54·7 oz., or 1552 grmm. This, which, for the present, may be assumed as the standard of the brain-weight of highly-endowed men, gives us an average of more than seven and a half ounces, or 217 grammes, above that which may be taken as the mean brain-weight of the average European at from 50 to 70 years of age.*

Brain-weights of Average and of Distinguished Men.

	Years.		Oz.	Grmm.		Ratio.
European—Average men	20—60	...	49	1390	...	100
„ „	50—70	...	47·1	1335	...	96
Ten distinguished men	50—70	...	54·7	1552	...	111
Excess in favour of the latter			7·6	217	...	15

Cultivated and intellectual man, according to the data before us, is endowed with a brain heavier by 15 per cent. than the average.

The doctrine of the connection between the size of the brain and great intellect has recently been much controverted, by men as distinguished as the late Professor Gratiolet in France and Professor Wagner† in Germany. They have, however, been answered, the former by M. Broca,‡ and the latter by Professor Welcker;§ to whose writings on this subject I must here content myself by referring.

Quetelet, writing in 1835, observed, "We have but very few data on the law of development of the brain, or upon its size and weight at different ages, either as regards average value or extreme limits."‖ Through the labours of another generation of medical observers, this reproach of the distinguished Belgian statist is no longer applicable. But, at the same time, it has been shown that there are many deficiencies remaining in this department of knowledge, which it behoves those who have time and opportunity for the task to endeavour gradually to supply. In this paper, something has been attempted towards the "thorough critical sifting" of the brain-weights hitherto reported, and which, as it has been pointed out by Professor Vogt,¶ they so much required.

philosopher, of wonderful versatility, industry, and power," William Whewell, D.D., who died at the age of 71, is reported by Dr. Humphry, of Cambridge, as 49 oz., or 1390 grmm. ('Lancet,' March 17, 1866, i, p. 279.) The brain, though "shrunken" and in "an atrophic state," must have once been megalocephalous.

* See Table VII. 1335 grammes, or the mean between 1365 and 1306 grmm.

† Wagner, 'Vorstudien,' II, 1862. 'Nachrichten Gott.,' 1862, Nov. 12, p. 478.

‡ Broca, "Sur le Volume et la Forme du Cerveau," 'Bull. de la Soc. d'Anthrop.' 1861, t. ii, *passim*.

§ "Gehirngrösse und Intelligenz," in 'Zwei seltnere Difformitäten,' &c., 1863, 12—19.

‖ 'Sur L'Homme,' iv, 1.

¶ Vogt, 'Vorlesungen über den Menschen,' 1863, iii, 102, Eng. ed., p. 86.

TABLE I.—*Maximum, Minimum, and Average Weights of the Brain at different Ages, as observed in 257 Men, at the Wilts County Asylum*, 1851—1864.

Ages of Men.	Numbers weighed.	Maximum Weights (Oz.).			Minimum Weights (Oz.).			Average Weights (Oz.).			Average Weights (Grmm.).		
		Cerebrum.	Cerebellum, &c.	Encephalon.	Cerebrum.	Cerebellum, &c.	Encephalon.	Cerebrum.	Cerebellum, &c.	Encephalon.	Cerebrum.	Cerebellum, &c.	Encephalon.
From 16 to 20 years	6	46·5	7·0	53·5	37·0	5·0	43·0	40·7	5·9	46·6	1153	167	1320
,, 20—30 ,,	20	54·0	8·0	62·0	30·0	5·0	35·5	42·0	6·2	48·2	1190	175	1365
,, 30—40 ,,	50	49·0	7·5	55·5	30·5	3·25	35·2	39·0	6·0	45·0	1105	170	1275
,, 40—50 ,,	50	52·0	7·0	59·0	32·0	5·0	38·0	40·5	6·1	46·6	1147	173	1320
,, 50—60 ,,	48	51·5	7·0	58·5	27·5	4·5	32·0	40·5	6·0	46·5	1147	170	1317
,, 60—70 ,,	43	47·2	7·5	53·5	32·2	4·7	38·0	40·4	6·0	46·4	1145	170	1315
,, 70—80 ,,	29	46·0	7·7	53·0	31·7	5·2	37·2	40·0	6·0	46·0	1133	170	1303
,, 80—87 ,,	11	47·0	6·7	53·7	32·0	5·0	38·0	38·9	5·9	44·8	1102	167	1269
,, 16—87 ,,	257	54·0	8·0	62·0	27·5	3·25	32·0	40·2	6·0	46·2	1139	170	1309
From 16 to 20 years	6	46·5	7·0	53·5	37·0	5·0	43·0	40·7	5·9	46·6	1153	167	1320
,, 20—60 ,,	168	54·0	8·0	62·0	27·5	3·25	32·0	40·3	6·0	46·3	1142	170	1312
,, 60—87 ,,	83	47·2	7·7	53·7	31·7	4·7	37·2	40·1	6·0	46·1	1136	170	1306
Totals and averages From 16 to 87 years	257	54·0	8·0	62.0	27·5	3·25	32·0	40·2	6·0	46·2	1139	170	1309

TABLE II.—*Maximum, Minimum, and Average Weights of the Brain at different Ages, as observed in* 213 *Women, at the Wilts County Asylum,* 1851—1864.

Ages of Women.	Numbers weighed.	Maximum Weights (Oz.).			Minimum Weights (Oz.).			Average Weights (Oz.).			Average Weights (Grmm.).		
		Cerebrum.	Cerebellum, &c.	Encephalon.	Cerebrum.	Cerebellum, &c.	Encephalon.	Cerebrum.	Cerebellum, &c.	Encephalon.	Cerebrum.	Cerebellum, &c.	Encephalon,
9 years	1	42·0	4·0	46·0	...	...	...	42·0	4·0	46·0	1190	113	1303
From 10 to 20 years	2	43·0	7·0	50·0	35·5	5·5	41·0	39·2	6·3	45·5	1111	178	1289
„ 20—30 „	12	40·7	6·5	47·7	28·0	4·5	32·7	36·0	5·5	41·5	1020	156	1176
„ 30—40 „	30	41·0	6·0	47·0	26·0	4·5	30·7	35·0	5·5	40·5	992	156	1148
„ 40—50 „	28	44·5	6·5	51·0	27·0	4·2	32·2	36·0	5·4	41·4	1020	153	1173
„ 50—60 „	40	46·0	6·7	51·5	28·5	3·5	32·5	35·7	5·3	41·0	1011	150	1161
„ 60—70 „	36	46·0	6·5	51·5	27·5	4·2	33·2	36·6	5·4	42·0	1037	153	1190
„ 70—80 „	43	40·0	6·0	45·2	27·0	4·5	31·5	34·8	5·2	40·0	986	147	1133
„ 80—90 „	19	47·5	6·0	53·2	30·0	4·5	34·5	35·2	5·3	40·5	997	150	1147
„ 90—92 „	2	37·5	5·5	43·0	30·0	4·5	34·5	33·7	5·0	38·7	955	141	1096
„ 9—92 „	213	47·5	7·0	53·2	26·0	3·5	30·7	35·6	5·4	41·0	1009	153	1162
From 9 to 20 years	3	43·0	7·0	50·0	35·5	5·5	41·0	40·1	5·5	45·6	1136	156	1292
„ 20—60 „	110	46·0	6·7	51·5	26·0	3·5	30·7	35·7	5·4	41·1	1011	153	1164
„ 60—92 „	100	47·5	6·5	53·2	27·0	4·2	31·5	35·4	5·3	40·7	1003	150	1153
Totals and averages From 9 to 92 years	213	47·5	7·0	53·2	26·0	3·5	30·7	35·6	5·4	41·0	1009	153	1162

TABLE III.—*Average Weights of the Brain at different Ages, as observed in 579 Men, at three English Asylums for the Insane.*

Ages of Men.	Somerset County Asylum.			Wilts County Asylum.			York Retreat.			Three Asylums. Totals and Averages.		
	Numbers Weighed.	Average Weights.		Numbers Weighed.	Average Weights.		Numbers Weighed.	Average Weights.		Numbers Weighed.	Average Weights.	
		Oz. Av.	Grmm.		Oz. Av.	Grmm.		Oz. Av.	Grmm.		Oz. Av.	Grmm.
From 10 to 20 years ...	6	43·8	1241	6	46·5	1317	...	...	...	12	45·1	1278
„ 20 — 30 „ ...	39	48·2	1365	20	48·2	1365	1	35·7	1011	60	47·9	1358
„ 30 — 40 „ ...	61	46·1	1306	50	45·0	1275	5	48·8	1383	116	45·7	1296
„ 40 — 50 „ ...	77	45·6	1292	50	46·6	1320	4	50·2	1423	131	46·1	1306
„ 50 — 60 „ ...	43	47·7	1351	48	46·5	1317	7	49·6	1405	98	47·2	1338
„ 60 — 70 „ ...	39	47·8	1354	43	46·4	1315	4	42·5	1204	86	46·8	1327
„ 70 — 80 „ ...	21	46·8	1326	29	46·0	1303	6	43·1	1221	56	46·0	1303
„ 80 — 90 „ ...	8	43·9	1244	11	44·8	1269	1	39·5	1120	20	44·1	1250
From 20 to 90 years ...	288	46·7	1323	251	46·2	1309	28	46·3	1312	567	46·5	1317
From 10 to 20 years ...	6	43·8	1241	6	46·5	1317	...	...	...	12	45·1	1278
„ 20 — 60 „ ...	220	46·6	1321	168	46·3	1312	17	48·7	1380	405	46·6	1320
„ 60 — 90 „ ...	68	47·0	1332	83	46·1	1306	11	42·6	1207	162	46·2	1309
Totals and Averages From 20 to 90 years	288	46·7	1323	251	46·2	1309	28	46·3	1312	567	46·5	1317

TABLE IV.—*Average Weights of the Brain at different Ages, as observed in 474 Women, at three English Asylums for the Insane.*

Ages of Women.	Somerset County Asylum.			Wilts County Asylum.			York Retreat.			Three Asylums. Totals and Averages.		
	Numbers Weighed.	Average Weights.		Numbers Weighed.	Average Weights.		Numbers Weighed.	Average Weights.		Numbers Weighed.	Average Weights.	
		Oz. Av.	Grmm.		Oz. Av.	Grmm.		Oz. Av.	Grmm.		Oz. Av.	Grmm.
From 10 to 20 years ...	...	...	...	2	45·5	1289	...	...	...	2	45·5	1289
„ 20 — 30 „ ...	30	44·5	1262	12	41·5	1176	1	43·5	1233	43	43·7	1238
„ 30 — 40 „ ...	49	44·0	1247	30	40·5	1148	2	42·3	1199	81	42·7	1210
„ 40 — 50 „ ...	49	42·2	1196	28	41·4	1173	8	43·2	1224	85	42·0	1190
„ 50 — 60 „ ...	39	43·2	1224	40	41·0	1161	...	...	...	79	42·1	1193
„ 60 — 70 „ ...	41	42·7	1210	36	42·0	1190	13	42·8	1213	90	42·4	1202
„ 70 — 80 „ ...	20	41·9	1187	43	40·0	1133	5	39·6	1122	68	40·5	1148
„ 80 — 90 „ ...	5	40·5	1148	19	40·5	1148	2	42·1	1193	26	40·6	1151
From 20 to 90 years ...	233	42·6	1207	208	41·0	1161	31	42·3	1199	472	41·9	1188
From 10 to 20 years ...	...	...	...	2	45·5	1289	...	...	...	2	45·5	1289
„ 20 — 60 „ ...	167	43·2	1224	110	41·1	1164	11	43·1	1221	288	42·4	1202
„ 60 — 90 „ ...	66	41·7	1182	98	40·7	1154	20	41·9	1187	184	41·2	1167
Totals and Averages From 20 to 90 years	233	42·9	1216	208	41·0	1161	31	42·3	1199	472	41·9	1188

TABLE V.—*Average Weights of the Brain in* 579 *Insane Englishmen, compared with those in* 323 *Scotch,* 159 *French, and* 152 *Germans, in the same Mental Condition.*

Ages of Men.	English (Three Asylums).			Scotch (Royal Edinburgh Asylum)			French (St. Yon, near Rouen).			German (Hildesheim, Hanover).		
	Numbers Weighed.	Average Weights.		Numbers Weighed.	Average Weights.		Numbers Weighed.	Average Weights.		Numbers Weighed.	Average Weights.	
		Oz. Av.	Grmm.		Oz. Av.	Grmm.		Oz. Av.	Grmm.		Oz. Av.	Grmm.
From 10 to 20 years ...	12	45·1	1278	8	45·7	1295	2	47·8	1355	8	42·3	1199
„ 20 — 30 „ ...	60	47·9	1358	41	49·8	1411	17	49·7	1409	28	51·4	1456
„ 30 — 40 „ ...	116	45·7	1296	81	50·4	1428	42	49·8	1411	43	49·3	1397
„ 40 — 50 „ ...	131	46·1	1306	76	50·3	1425	46	48·2	1366	38	49·7	1408
„ 50 — 60 „ ...	98	47·2	1338	61	50·4	1428	31	47·5	1346	18	49·8	1412
„ 60 — 70 „ ...	86	46·8	1327	43	48·4	1371	14	47·1	1334	12	49·8	1412
„ 70 — 80 „ ...	56	46·0	1303	10	51·3	1454	7	46·4	1315	5	50·4	1428
„ 80 — 90 „ ...	20	44·1	1250	3	48·6	1377				.	.	.
From 20 to 90 years ...	567	46·5	1317	315	50·0	1417	157	48·1	1363	144	49·9	1414
From 10 to 20 years ...	12	45·1	1278	8	45·7	1295	2	47·8	1355	8	42·3	1199
„ 20 — 60 „ ...	405	46·6	1320	259	50·3	1425	136	48·8	1383	127	49·9	1414
„ 60 — 90 „ ...	162	46·2	1309	56	48·9	1386	21	46·7	1324	17	50·0	1417
Totals and Averages From 20 to 90 years	567	46·5	1317	315	50·0	1417	157	48·1	1363	144	49·9	1414

TABLE VI.—*Average Weights of the Brain in 474 Insane English Women compared with those in 237 Scotch, 125 French, and 90 Germans, in the same Mental Condition.*

Ages of Women.	English (Three Asylums).			Scotch (Royal Edinburgh Asylum).			French (St. Yon, near Rouen).			German (Hildesheim, Hanover).		
	Numbers Weighed.	Average Weights.		Numbers Weighed.	Average Weights.		Numbers Weighed.	Average Weights.		Numbers Weighed.	Average Weights.	
		Oz. Av.	Grmm.		Oz. Av.	Grmm.		Oz. Av.	Grmm.		Oz. Av.	Grmm.
From 10 to 20 years ...	2	45·5	1289	4	40·2	1139	...	...	...	2	40·2	1139
„ 20—30 „ ...	43	43·7	1238	27	45·0	1275	10	43·2	1224	17	44·5	1261
„ 30—40 „ ...	81	42·7	1210	59	44·9	1272	25	43·9	1244	20	43·9	1244
„ 40—50 „ ...	85	42·0	1190	54	44·3	1255	32	42·8	1214	19	41·5	1176
„ 50—60 „ ...	79	42·1	1193	50	45·2	1281	19	43·0	1218	14	42·5	1204
„ 60—70 „ ...	90	42·4	1202	31	43·3	1227	21	41·5	1175	15	42·9	1216
„ 70—80 „ ...	68	40·5	1148	11	44·2	1253	18	40·5	1149	3	42·9	1216
„ 80—90 „ ...	26	40·6	1151	1	41·5	1176				...	...	...
From 20 to 90 years ...	472	41·9	1188	233	45·5	1289	125	42·5	1205	88	43·1	1221
From 10 to 20 years ...	2	45·5	1289	4	40·2	1139	...	...	...	2	40·2	1139
„ 20 to 60 „ ...	288	42·4	1202	190	45·9	1300	86	43·2	1224	70	43·1	1221
„ 60—90 „ ...	184	41·2	1167	43	43·5	1233	39	41·0	1162	18	42·9	1216
Totals and Averages From 20 to 90 years	472	41·9	1188	233	45·5	1289	125	42·5	1205	88	43·1	1221

TABLE VII.—*Average Weights of the Brain at different Ages, as observed in* 1077 *Men in different Countries of Europe.*

Ages of Men.	English (*Boyd*).			Scotch (*Peacock*).			Germans, French, and English (*Wagner*).						English, Scotch, and Germans. Totals and Averages.*		
							As by M. Broca.			As by Welcker.					
	Numbers Weighed.	Average Weights.		Numbers Weighed.	Average Weights.		Numbers Weighed.	Average Weights.		Numbers Weighed.	Average Weights.		Numbers Weighed.	Average Weights.	
		Oz. Av.	Grmm.		Oz. Av.	Grmm.		Oz. Av.	Grmm.		Oz. Av.	Grmm.		Oz. Av.	Grmm.
From 10 to 20 years	19	48·5	1374	17	49·6	1405	11	51·7	1465	23	47·5	1346	47	49·6	1405
„ 20 — 30 „	59	47·9	1357	40	50·8	1439	13	47·3	1341	67	49·5	1404	112	48·9	1385
„ 30 — 40 „	110	48·2	1366	41	51·0	1445	36	49·7	1410	137	49·5	1404	187	49·0	1389
„ 40 — 50 „	137	47·7	1352	44	49·2	1394	36	49·1	1391	123	48·6	1379	217	48·2	1366
„ 50 — 60 „	119	47·4	1343	32	49·6	1405	31	47·3	1341	88	48·1	1365	182	47·7	1352
„ 60 — 70 „	127	46·4	1315	18	48·5	1374	}			65	46·1	1306	}		
„ 70 — 80 „	104	45·5	1289	5	48·1	1363	} 51	46·7	1326	27	47·9	1356	} 332	46·2	1309
„ 80 — 90 „	24	45·3	1284	3	49·8	1411	}			8	43·8	1242	}		
From 20 to 90 years	680	47·1	1334	183	49·7	1408	167	48.0	1362	515	47·7	1351	1030	47·7	1351
From 10 to 20 years	19	48·5	1374	17	49·6	1405	11	51·7	1465	23	47·5	1346	47	49·6	1405
„ 20 — 60 „	425	47·8	1354	157	50·0	1417	116	48·3	1370	415	49·0	1390	698	48·4	1371
„ 60 — 90 „	255	45.9	1300	26	48·8	1382	51	46·7	1326	100	45·9	1301	332	46·2	1309
Totals and Averages From 20 to 90 years	680	47·1	1334	183	49·7	1408	167	48·0	1362	515	47·7	1351	1030	47·7	1351

TABLE VIII.—*Average Weights of the Brain at different Ages, as observed in* 1002 *Women in different Countries of Europe.*

Ages of Women.	English (*Boyd*).			Scotch (*Peacock*).			Germans, French, and English (*Wagner*).						English, Scotch, and Germans. Totals and Averages.*		
							As by M. Broca.			As by Welcker.					
	Numbers Weighed.	Average Weights.		Numbers Weighed.	Average Weights.		Numbers Weighed.	Average Weights.		Numbers Weighed.	Average Weights.		Numbers Weighed.	Average Weights.	
		Oz. Av.	Grmm.		Oz. Av.	Grmm.		Oz. Av.	Grmm.		Oz. Av.	Grmm.		Oz. Av.	Grmm.
From 10 to 20 years	16	43.9	1244	15	44·4	1260	13	45.3	1285	18	43·1	1221	44	44·5	1262
„ 20 — 30 „	72	43·7	1238	26	44·9	1272	20	44·0	1249	54	44·1	1251	118	43·9	1244
„ 30 — 40 „	89	43·0	1218	33	45·2	1281	17	44·5	1262	71	44·8	1272	139	43·7	1238
„ 40 — 50 „	106	42·8	1213	23	45·1	1278	25	44·4	1261	82	43·5	1234	154	43·4	1229
„ 50 — 60 „	103	43·1	1221	7	45.1	1278	15	43·6	1236	51	43·5	1234	125	43·3	1227
„ 60 — 70 „	149	42·6	1207	14	43·2	1224	}			62	42·8	1213	}		
„ 70 — 80 „	148	41·2	1167	2	42·6	1207	32	42·4	1203	31	40·9	1159	422	41·6	1178
„ 80 — 90 „	77	39·7	1125	...	...	...	}			6	40·7	1154	}		
From 20 to 90 years	744	42·3	1199	105	44·3	1255	109	43·6	1236	357	43·0	1217	958	42·7	1210
From 10 to 20 years	16	43·9	1244	15	44·4	1260	13	45·3	1285	18	43·1	1221	44	44·5	1262
„ 20 — 60 „	370	43·1	1221	89	45·0	1275	77	43·9	1244	258	44·0	1247	536	43·5	1233
„ 60 — 90 „	374	41·5	1176	16	42·9	1216	32	42·4	1203	99	41·5	1175	422	41·6	1178
Totals and Averages From 20 to 90 years	744	42·3	1199	105	44·3	1255	109	43·6	1236	357	43·0	1217	958	42·7	1210

** The numbers from Wagner's table, abstracted by Professor Welcker and myself, and given in the preceding columns, include the brains of many insane persons, and also those abstracted by M. Broca from the same table. They are therefore not included in these tables and averages.

TABLE IX.—*Average Weights of the Brain at all Periods of Existence, as observed by Dr. Boyd, in* 2030 *Cases, at the Infirmary of St. Marylebone, London.* 1839—1847.

Ages.	Male.			Female.		
	Numbers Weighed.	Average Weights.		Numbers Weighed.	Average Weights.	
		Oz. Av.	Grmm.		Oz. Av.	Grmm.
Premature, stillborn	25	5·6	159	18	4·62	131
Stillborn, full period	43	13·87	393	31	12·25	347
New born	42	11·67	331	39	10·0	283
Under 3 months ...	16	17·42	493	20	15·94	452
From 3 to 6 months	15	21·3	603	25	19·76	560
„ 6—12 „	46	27·4	777	40	25·7	728
„ 1— 2 years	34	33·25	942	33	29·8	844
„ 2— 4 „	29	38·7	1097	29	34·97	991
„ 4— 7 „	27	40·23	1140	19	40·11	1136
„ 7—14 „	22	45·96	1302	18	40·78	1155
„ 14—20 „	19	48·54	1374	16	43·94	1244
„ 20—30 „	59	47·9	1357	72	43·7	1238
„ 30—40 „	110	48·2	1366	89	43·0	1218
„ 40—50 „	137	47·7	1352	106	42·8	1213
„ 50—60 „	119	47·4	1343	103	43·1	1221
„ 60—70 „	127	46·4	1315	149	42·6	1207
„ 70—80 „	104	45·5	1289	148	41·2	1167
„ 80—90 „	24	45·3	1284	77	39·7	1125
Totals.....	998	...	...	1032	...	...

TABLE X.—*Brains of 257 Men and 213 Women, observed at the Wilts County Asylum, arranged in Five Classes as to Weight (viz., as regards Extreme, Medium, and Small size), compared with 511 Brains of Men and 351 of Women, from the Table of Wagner, similarly arranged.*

Brains of Men.	Numbers Weighed.		Ratio : 100.		Brains of Women.	Numbers Weighed.		Ratio : 100.	
	Wilts Co. Asylum.	Wagner.	Wilts Co. Asylum.	Wagner.		Wilts Co. Asylum.	Wagner.	Wilts Co. Asylum.	Wagner.
DECIDED MEGALOCEPHALY: Brains of exceptionally great size, weighing 55 oz. av. or 1560 grmm. and upwards	10	53	3·9	10·4	DECIDED MEGALOCEPHALY: Brains of exceptionally great size, weighing 50 oz. or 1417 grmm. and upwards	7	20	3·3	5·7
INCIPIENT MEGALOCEPHALY: Brains of great size, weighing from 52½ oz. or 1490 grmm., to 55 oz. or 1560 grmm	15	56	5·8	11·0	INCIPIENT MEGALOCEPHALY: Brains of great size, weighing from 47½ oz. or 1345 grmm., to 50 oz. or 1417 grmm	7	34	3·3	9·7
BRAINS OF MEDIUM SIZE, weighing from 40 oz. or 1130 grmm., to 52½ oz. or 1490 grmm.	205	382	79·8	74·7	BRAINS OF MEDIUM SIZE, weighing from 35 oz. or 990 grmm., to 47½ oz. or 1345 grmm.	180	289	84·5	82·3
INCIPIENT MICROCEPHALY: Brains of small size, weighing from 37½ oz. or 1062 grmm., to 40 oz. or 1130 grmm.	17	15	6·6	2·9	INCIPIENT MICROCEPHALY: Brains of small size, weighing from 32½ oz. or 920 grmm., to 35 oz. or 990 grmm	14	5	6·6	1·4
DECIDED MICROCEPHALY: Brains of exceptionally small size, weighing not more than 37½ oz or 1062 grmm	10	5	3·9	1·0	DECIDED MICROCEPHALY: Brains of exceptionally small size, weighing not more than 32½ oz. or 920 grammes	5	3	2·3	0·9
Totals	257	511	100·0	100·0	Totals	213	351	100·0	100·0