The morphological and histological aspects of microcephalic and cretinoid idiocy / by Fletcher Beach.

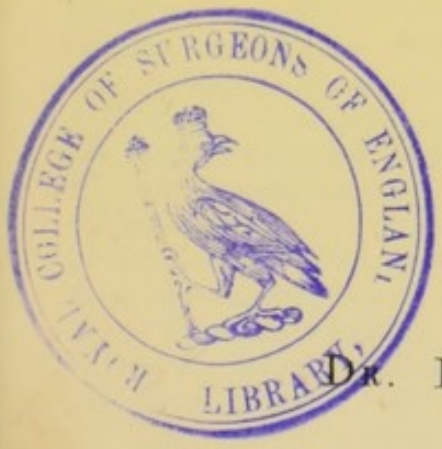
International Medical Congress

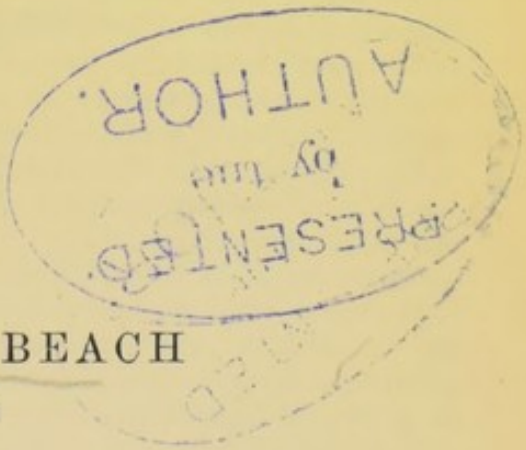
THE

MORPHOLOGICAL AND HISTOLOGICAL ASPECTS

OF

MICROCEPHALIC AND CRETINOID IDIOCY





BY

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This paper is intended specially as a contribution to the subject of microcephalic and cretinoid idiocy. I had intended to add to it an account of atrophy of the brain in imbeciles, and briefly refer to some other cases, illustrating them by microscopical sections, but want of time has prevented me from carrying out this part of my subject. It appears to me, that by connecting the mental symptoms occurring during life with the appearances, both naked eye and microscopic, found in the brain after death, some advance may be made in our knowledge of the relation which the one bears to the other, and as usually the symptoms in idiocy are less complex than those of insanity, so we may hope for some success in the inquiry, and possibly aid in elucidating the more obscure relations between mental symptoms and brain states in the latter disease. Just as Broca has connected aphasia with disease, usually of the posterior part of the third left frontal convolution, or as some think of the operculum which is included between the ascending and horizontal limbs of the fissure of Sylvius, which immediately overlaps the island of Reil, and as motor paralyses of the limbs have been connected with disease of certain convolutions, by the labours of Hughlings Jackson, Ferrier, and others, and some light has been thrown upon the parts of the brain implicated in disease, involving loss of the sense of hearing, sight, &c., so we may hope in time by the same method to explain the mental symptoms occurring during life in cases of idiocy. Observation and experiment, the latter made for us by disease, have always been the means of elucidating the truth, and it assuredly will do so for us in medico-psychology, as well as in other branches of science. I am aware that it is held by some that disease affecting the mind cannot, and never will be explained by appearances found in the brain, and assuredly the attempt to do so will involve some labour and hard work, but I hold that it is better to make the attempt than to fold our arms and do nothing in that direction. The admirable researches of Bevan Lewis and Professor Betz, the latter of whom has made 5,000 sections of the convolutions of the brain in different individuals, show that the layers of nerve cells are differently arranged, not only in different convolutions, but in different parts of the same convolution, and mark a considerable advance in our knowledge of the subject. The study of the histology of the convolutions of the brain

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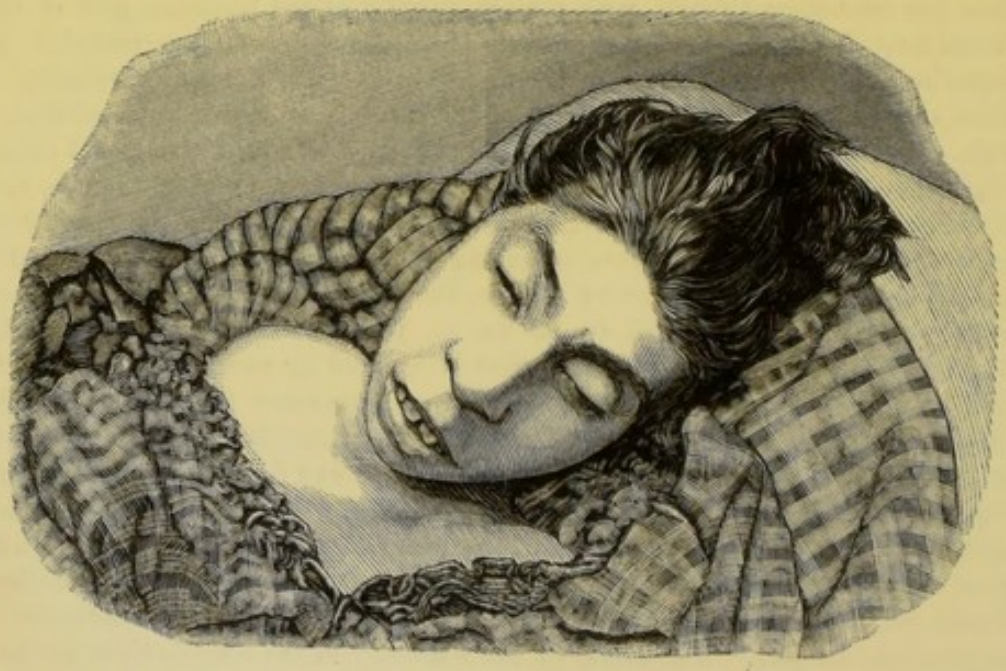
* The term Idiocy is used in this paper in deference to the opinions of those who made use of it when drawing up the list of subjects for discussion in this section, but the author believes the word Imbecility to be a far preferable one, as it includes all cases, both congenital and acquired, of mental defect, and avoids all difficulty in their classification, such as sometimes occurs when the words Idiot and Imbecile are used, for it is sometimes difficult to say under which heading a patient should be placed.

in health and disease is yet in its infancy; but, as time goes on, other facts will no doubt be made out.

To illustrate my subject, I have related in this paper two cases of microcephalic idiocy, and I exhibit and describe the condition of the brain in both, adding to the latter a short description of the microscopical appearances. The brain of the first case weighed seven ounces when removed from the body and is one of the smallest on record; I have therefore given a full account of its fissures and convolutions. With respect to cretinoid idiocy, I propose to exhibit the brain of one case, the fatty tumours of another, and microscopical sections from a third.

E. R., aged eleven years, was admitted into Clapton Asylum, May 8, 1875, with the following history:—The parents were of temperate habits, sound mentally and physically, and not connected by consanguinity. There was no history of hereditary disease in the family. The child had a small head when born, and had at no time shewed much intellect. The mother assigns the patient's condition to the father playfully striking her across the forehead with a cod's head and shoulders when she was four months advanced in pregnancy. There are nine other children who are healthy and well-formed. Two of these are married, and their children present no defect. Two have died, and of these one, the youngest in the family, was microcephalic, and died in Caterham Asylum, aged six years. The present is the eighth child. On admission, she was fairly nourished and of dark complexion. Her head was very small. Her forehead sloped backwards at an obtuse angle, and there was prognathism of the lower part of the face. From the size of her head and her facial aspect, she was called by the nurses "the fish." Her hair which came low down on her forehead was light brown and erectile. Eyes blue, arch of palate high, tongue of normal size, teeth good, protruding beyond lips. Ears $2\frac{1}{2}$ inches in length, $1\frac{1}{2}$ inches in breadth. Her arms and legs presented many soft and downy hairs of a light brown colour. She was 3 feet $6\frac{1}{4}$ inches in height, and weighed 2 stone 6 lbs. No sign of rickets.



E. R., microcephalic idiot, from a photograph taken after death.

She could not stand or walk, though she could move her arms and legs about. There was no sign of paralysis, and she was not epileptic. Her sight was normal. She was quiet in disposition, obedient, and spent most of her time sitting in a chair in her ward. She passed her urine and fæces under her, and made so sign to have these wants attended to. She could not speak. She was fed with a spoon, and was entirely

dependent on others for existence. After about six months' residence in the asylum, she became rather more intelligent, made an attempt to speak, and mumbled something indistinctly. She would put out her hand when told to shake hands, and would recognize, by a smile, the nurse and myself when we spoke to her. After about four months more she was noticed to grind her teeth when pleased, and when spoken to pretended to be shy, and put her hands before her eyes. Her habits became slightly improved. She was fond of her nurse. Observation, attention, memory, affection, and some power of voluntary movement were therefore present. On the day before her death she became suddenly collapsed, but recovered slightly. In the evening she became restless, and her breathing quick, and on January 24, 1876, she died. She was twelve years old at the time of her death. The following are some measurements taken during life.

HEAD.

Circumference of head	12 inches.
Transverse diameter (between tips of ears)	$4\frac{3}{4}$ „
Root of nose to occipital protuberance	7 „
Tip of nose to auditory meatus	4 „
Occipital protuberance to auditory meatus	4 „
Root of nose to chin	4 „
Auditory meatus to chin	5 „
Auditory meatus to alveolar margin	$4\frac{1}{2}$ „
Height of forehead	2 „
Width of forehead	$3\frac{1}{2}$ „

BODY.

Tip of shoulder to elbow	8 inches.
Elbow to wrist	6 „
Wrist to tip of middle finger	$4\frac{1}{2}$ „
Anterior inferior spine of ileum to knee	11 „
Knee to external malleolus	9 „
Sole of foot (from heel to end of big toe)	9 „
Circumference of chest (one inch below nipples)	22 „
Circumference of abdomen	17 „

The autopsy was made forty-eight hours after death. Body thin, but not emaciated. There was a cyst over the left part of the forehead, the size of a large cob nut, and the thyroid gland was enlarged. The pubic hair was fairly developed. On examining the head, the vault of the skull was found to be arched, the occipital region flattened, and the forehead sloping. After the scalp had been removed, the sutures were examined. They were united, but the coronal was found to be much farther back than normal. On removing the calvaria and brain the base of the skull was inspected, and some measurements taken.

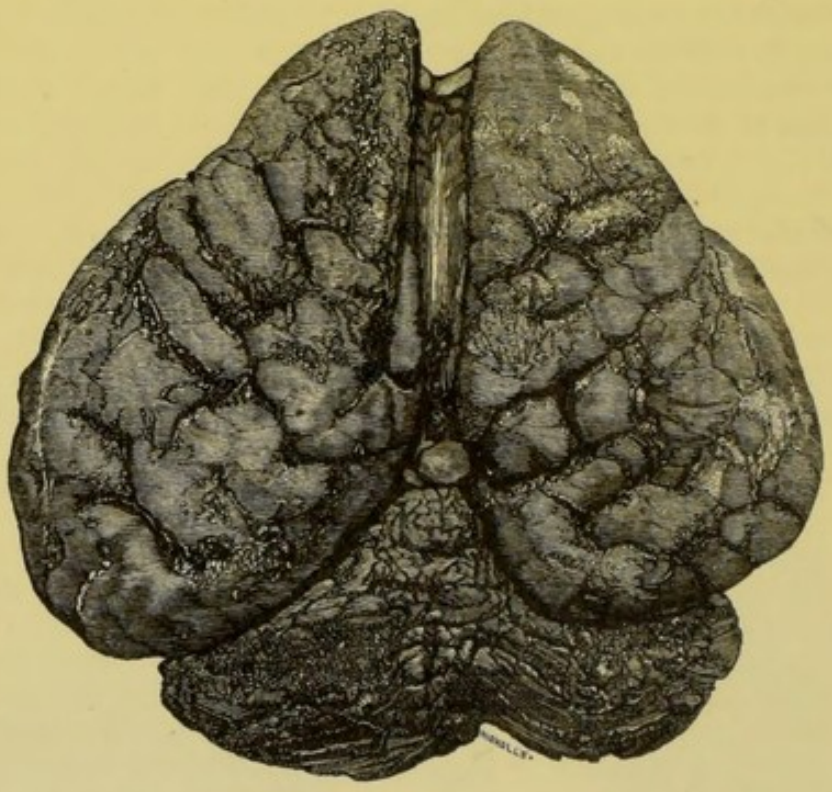
Anterior border of cranium to anterior clinoid process	$1\frac{1}{4}$ in.
Between clinoid processes	$\frac{3}{8}$ in.
From posterior border of sella turcica to posterior margin of cranium	$2\frac{1}{2}$ in.
Transverse measurement of anterior fossæ	$2\frac{1}{4}$ in.
Middle fossæ in length	$1\frac{1}{2}$ in.
Middle fosæ in breadth	$1\frac{1}{8}$ in.
Transverse measurement of cerebellar fossæ	$2\frac{7}{8}$ in.
Transverse measurement of interior of cranium	$3\frac{1}{8}$ in.

The form of the base of the skull was generally normal, but the floor of the anterior fossæ was more prominent than usual. The cerebellar fossæ were large and deep. The anterior and posterior clinoid processes were on the same level, and the descent from the latter was sharp and perpendicular. The suture between the sphenoid and occipital bones was soft, and could be cut with a knife. The palate was

$2\frac{1}{8}$ inches in length, and was much narrowed perpendicularly. The incisor teeth were placed obliquely.

The brain weighed seven ounces. After preservation in spirit for six years, it weighs two ounces, and might be the brain of a good sized doll, rather than that of a child twelve years old. The different portions have not been weighed separately, as I have been anxious that members of the Congress should see it as nearly as possible in the entire condition.* It must be understood that the following description refers to the preserved brain and not to its fresh state.

The cerebrum when viewed from above is seen to approach the isosceles triangle in shape, being narrow and pointed in front, and of a somewhat square shape behind. There is an absence of the roundness seen in the normal brain, and the borders are narrow and angular. The upper surface is flattened. The two hemispheres are markedly asymmetrical. The left is appreciably larger and longer than the right, and is pear-shaped, while the right is more triangular. Of the lobes, the frontal and



Brain of E.K., a microcephalic idiot—natural size—the sutures are not clearly shown as the membranes have unfortunately not been removed.

temporo-sphenoidal are well developed, the parietal fairly so, while the occipital are small, and chiefly developed on the under surface of the brain. As regards mass, on the left side, the temporo-sphenoidal are the largest, and next come the frontal, parietal and occipital, in the order mentioned. On the right side the frontal and temporo-sphenoidal are about the same size. The cerebellum, a large portion of which is uncovered, projects half an inch behind the cerebrum, and forms nearly a fourth of the entire mass, and gives a short ovoid appearance to the whole encephalon. Viewed from the base, the size of the cerebellum is again a marked feature. The temporal and frontal regions are well marked, the latter being triangular and pointed, while the former approach the oblong in shape. The orbital surfaces are only slightly excavated. The base as well as the upper surface is flattened.

Fissures.—The fissures of Sylvius (horizontal portions) are well marked and are very deep; that on the left side being $1\frac{1}{8}$ in. in depth, and on the right $\frac{7}{8}$ in. They

* This was afterwards found impossible.

both have an oblique position from without inwards, but the left is more oblique than the right. The upper end of the left bifurcates to receive the posterior end of the supra-marginal lobule. The ascending portions of these fissures are not visible.

The fissures of Rolando are not so well marked as the fissures of Sylvius. The right is better marked than the left, and commences a little above the middle of the fissure of Sylvius; curves slightly round a projection of the middle part of the ascending parietal convolution, and terminates nearly $\frac{1}{4}$ in. from the longitudinal fissure. On the left side it is less perfect. Its commencement is faintly seen to commence $\frac{1}{7}$ in. from the upper end of the Sylvian fissure. After passing upwards $\frac{1}{4}$ in. it ceases, but $\frac{1}{7}$ in. further on recommences, being still faintly marked, and runs for $\frac{5}{8}$ in. towards the longitudinal fissure, the upper $\frac{4}{8}$ in. being well marked. It can then be faintly seen to curve for $\frac{1}{4}$ in. round the posterior part of the parietal lobule, then runs backwards for $\frac{1}{4}$ in. (this part being well marked) and ends finally on the inner surface of the hemisphere.

Of the external perpendicular fissures the left is the better marked. It commences by a deep sulcus on the inner surface of the corresponding hemisphere, which a little in front has commenced to diverge from the right, and runs backwards and outwards for $\frac{1}{2}$ in., where it is interrupted by the first external connecting convolution. The right commences by a curve on the inner surface of the right hemisphere and runs almost transversely outwards for $\frac{3}{8}$ in., being joined at the outer extremity by a sulcus running at right angles to it, which separates the parietal lobule from the first external connecting convolution.

Of the great parallel fissures the left is deep, simple and well marked, and runs in a slightly curved line backwards for one inch. On the right side it is not so well marked and is slightly tortuous.

The callosal-marginal fissures are very different on the two sides. That on the left side is very simple. It passes backwards in a continuous curved line and reaches the surface of the hemisphere some distance behind the hinder end of the corpus callosum. On the right side it is interrupted by a convolutional bridge above the middle of the corpus callosum. It reaches the upper surface of the hemisphere on a level with the hinder border of that body.

The internal perpendicular fissures are also different. That on the left side descends obliquely, but is interrupted by a small convolutional bridge in the middle. On the right side it descends and takes two curves forwards (the curves being caused by projections of the quadrilateral lobule) and ends just above the posterior extremity of the corpus callosum. Neither of these fissures joins those of the hippocampi below.

The fissures of the hippocampi are not horizontal. On the left side the fissure is represented by two parallel ones running obliquely downwards, and separated by a thin ridge of convolutional substance. One, the longer, commences at the tip of the occipital lobe, the other, the shorter, commences $\frac{3}{8}$ in. below. Both join inferiorly a deep sulcus which represents the posterior part of the collateral fissure. On the right side it approaches the perpendicular in direction and commences with a slight curve a little below the tip of the occipital and then runs straight downwards.

The collateral fissure on the right side is marked by a very slight irregular depression. On the left side anteriorly there is a curved depression which is separated from the deep sulcus before mentioned by a layer of convolutional substance, $\frac{1}{4}$ in. in width.

With respect to these fissures, the Sylvian are shorter than in man (normal) or the ape. They are more vertical than in man, less vertical than the ape. Neither has an ascending branch. The fissure of Rolando on the right side is much in advance of that on the left in consequence of the smaller size of the latter hemisphere. On this side it is a simple, oblique, slightly curved sulcus more perpendicular than in man. On the left side it is interrupted in its course and less distinct. The external perpendicular fissures are interrupted by the first external connecting convolutions as in man.

Assuming the total length of the cerebrum to be 100, the relative length of the

three regions—in front of the fissure of Rolando, between it and the perpendicular fissure, and behind that fissure—are in the preserved brain on the left side 61, 14, 25, and on the right 60, 20, 20. In the healthy brain the lengths are 54, 23, 23, and in the chimpanzee 49, 28, 23. The frontal part then of this brain is relatively the largest in both hemispheres and slightly exceeds the healthy ratio, while the parietal part is largest in the right brain, where it nearly reaches that ratio. It is only about two-thirds the proper size in the left hemisphere. The occipital region is slightly larger in the left hemisphere, which slightly exceeds the healthy ratio, but on the right side it is a little below it. Both frontal regions considerably exceed the corresponding ones in the chimpanzee; the left parietal region is only half the size of the region in that animal, and the right about two-thirds the size. The left occipital is a little above, and the right a little below the occipital region in the chimpanzee. The parallel fissures are shorter than normal, but preserve the oblique direction. Of the internal perpendicular fissures, the right is the more tortuous, and oblique, and consequently marks a greater contrast with the vertical direction in the ape. The left is also oblique, but not to so great an extent as the right. Neither of the fissures of the hippocampi are horizontal, and that on the right side is nearly vertical and so approaches the quadrumanous form. On the left side it is anomalous in consequence of its division and its junction with the collateral fissure. There is marked asymmetry of all the fissures on the two sides of the brain.

Convolutions.—The orbital convolutions are very simple. The sulcus which lodges the right olfactory nerve is represented simply by an oval depression the size of a pin's head, and a small linear depression $\frac{1}{8}$ in. long, separated from the oval one by a small line of brain substance. The sulcus on the left side is absent. Instead of the triradiate sulci there is on the right side externally a short, deep, slightly angular depression $\frac{3}{8}$ in. in length, and internally a shallow, straight one $\frac{1}{4}$ in. in length. On the left side there is internally a deep straight depression nearly $\frac{3}{8}$ in. in length and externally a shallow one a little more than $\frac{1}{8}$ in. long. There is therefore asymmetry.

The three frontal convolutions can be distinguished on both sides, but are asymmetrical. The superior frontal on the left side extends backwards 2 inches in a longitudinal direction and is a simple broad band of brain matter, marked only by three depressions $\frac{1}{8}$ in. long in the anterior half. This convolution forms nearly half the frontal lobe. Its lower border in the anterior third of its course joins the upper border of the second frontal, which lies immediately below it. This (second) convolution is not so well defined in its posterior part. It is bounded above and in front by the first frontal, and posteriorly is separated by a shallow straight depression from the ascending frontal. Below it bifurcates and joins the anterior and posterior parts of the third frontal convolution which runs horizontally below the second and the first convolution. On the right side the first frontal extends backwards for $1\frac{1}{4}$ in. only and is absolutely without any depression on its surface. The second is placed perpendicularly below the first, which it joins by a thin convolution posteriorly. It also joins the upper surface of the third by its anterior inferior border. This second convolution is simply a broad band of brain matter with a curved depression $\frac{3}{8}$ in. long in its centre. The third runs horizontally below the other two, and is joined to both.

Of the two ascending frontal convolutions, the right is the better marked, but both are simple. It commences a little in front of the middle of the upper border of the Sylvian fissure, and in its upper third curves slightly backwards, becomes wider, and ends by joining the upper part of the ascending parietal. The outline of the left is not well marked below and in front. It joins the posterior part of the first frontal above.

The ascending parietal are much better marked, and of the two the right is the larger. Both are very simple, being straight convolutions, ascending on the right side from the middle, on the left side from the posterior part of the upper border of the fissure of Sylvius. There is a simple square parietal lobule on the right side, and a curved oblong one on the left.

The supra-marginal convolution, its lobule, and the angular convolution on the

left side, are exceedingly small and form one single convolution. The lobule joins in front the ascending parietal and behind a branch from the first external connecting convolution, which forms the second external connecting convolution. Below, the angular convolution joins the upper part of the first temporal about its middle, $\frac{1}{2}$ in. posterior to the upper end of the fissure of Sylvius. On the right side they still form one convolution, but it is much larger. In front it is seen to join the lower third of the ascending parietal, while by its posterior surface it is connected with the second and third connecting convolutions. The angular portion joins the middle of the upper part of the first temporal, curving round the lower end of the Sylvian fissure. Posteriorly it is connected with the third external connecting convolution.

The *central lobe, or island of Reil*, is not distinctly recognizable on either side On the left side there is a slight projection of brain substance, which may represent it, continuous with the lower part of the ascending frontal and the posterior part of the third frontal at the entrance to the Sylvian fissure. On the right side the projection is a little more prominent in the same position, having the same relation to the neighbouring convolutions. The *temporal convolutions* are much larger on the left side than the right, but are very simple on each side. The first is continuous in front and below with the upper part of the second, above, about its middle, with the second connecting convolution, and behind with the occipital by means of the third connecting convolution. It is separated from the third temporal below by the parallel fissure. The second is very small, measuring only one inch in length. It is continuous above in its anterior part with the first, and below, both anteriorly and posteriorly, with the third. The latter is the largest of the three, and is somewhat pear-shaped. Its upper part is situated at the lower and outer border of the hemisphere, being bounded above and in its posterior half by the parallel fissure. The greater portion of this convolution, is situated on the base of the hemisphere, where anteriorly it forms the body of the pear, so to speak, and is separated from the uncinate convolution by the collateral fissure which in this part is very shallow. A curved sulcus $\frac{5}{8}$ inches in length, is situated in the centre of this convolution. Posteriorly and inferiorly it joins the occipital. On the left side, the temporal convolutions are altogether smaller and not so well marked. The first is continuous, superiorly, and posteriorly, with the occipital by the fourth connecting convolution. The second is placed at the lower and outer border of the hemisphere, the greater part of it being situated on the base, and, owing to the contracted state of the brain here, is situated above the uncinate convolution. The third is continuous with the lower part of the second, by a fairly broad convolution, and then describes a simple semicircle around a large irregular opening $\frac{5}{8}$ in. long, and $\frac{1}{4}$ in. broad, which is the posterior part of the lateral ventricle. The posterior half of this convolution is placed below the occipital portion of the brain.

The *occipital convolutions* on the left side are represented on the convex surface by a narrow ridge of brain substance, connected in front with the parietal lobule and first and third temporal convolutions by the first, third, and fourth external connecting ones. The greater portion, owing to the narrow posterior border of the hemisphere, is situated on the base, where a triangular convolution having in its centre a small triradiate sulcus is present. No distinction of three layers of convolutions can be seen. On the right side, on the convex surface, a larger portion of brain substance representing them is present and a smaller portion on the base, but as on the left side, no distribution of three layers can be clearly made out. The portion on the convex surface is connected with the parts in front by means of the four connecting convolutions. Of the *external connecting convolutions*, the upper are the largest and completely bridge over the perpendicular fissure. The left is the larger of the two, and is relatively to the size of the brain a broad massive band. It gives off from its lower border a branch forming the second connecting convolution which joins the supra-marginal lobule in front, and the first temporal by means of a convolution below. The third joins the first temporal, and the fourth the third temporal. All are quite

superficial. On the right side, the convolution is still large, and takes a sinuous course downwards and forwards to join the posterior part of the ascending parietal. Although its course is superficial, its junction is not, for a deep sulcus intervenes. The second is placed low down and joins the supra-marginal lobule; the third is blended with the fourth behind, but in front it joins the angular convolution, while the fourth joins the first temporal. The third and fourth are not so well marked as those on the left side. They are quite asymmetrical on the two sides.

The *marginal convolutions* on both sides are very simple, much more so than in the ape, being simple bands of brain substance, uninterrupted by transverse sulci, which run backwards and terminate on the left side, $\frac{1}{4}$ inch posterior to, and on the right opposite to the hinder end of the corpus callosum. On both sides, owing to the large size of the frontal, and small size of the parietal convolutions, they terminate in front of the ascending parietal convolutions—in fact, opposite the junction of the upper part of the ascending frontal with the ascending parietal. Above the corpus callosum the marginal convolution is joined, as usual, to the convolution of that body, on the right side, but the connecting band is absent on the left side.

The *convolution of the corpus callosum* on each side commences in the usual way beneath the genu of that body, and on the left side passes backwards and becomes wider, but its connection with the uncinate convolution cannot be made out. Instead, the smooth lower border of the convolution of the corpus callosum is continuous with the smooth lower borders of the quadrilateral and occipital lobules, and indeed there is a deep sulcus $\frac{1}{5}$ in. wide, between the lower border of the occipital lobule, and the posterior end of the uncinate convolution. The lower border of the convolution of the corpus callosum and of the quadrilateral lobule is bounded below by a thin ridge of brain substance $\frac{1}{2}$ in. long and scarcely the thickness of a wafer, which connects the posterior extremity of the corpus callosum with the posterior extremity of the uncinate convolution. On the right side the convolution becomes thinner as it passes backwards, and ends, a little posterior to the corpus callosum, by joining a thin band of brain substance, which is continuous with the anterior extremity of the occipital lobe. On this side, as before mentioned, there is a connecting bridge of convolutional substance passing from this to the marginal convolution. Both convolutions of the corpus callosum are absolutely simple, and without transverse sulci.

The *quadrilateral lobule*, the prolongation upwards and backwards of the convolution of the corpus callosum, is well developed on both sides. On the left it is continuous with the posterior and lower border of the convolution of the corpus callosum by a small convolution nearly $\frac{1}{4}$ in. wide. On the right side it sends forward a wedge-shaped ridge of convolutional substance to join the lower border of the marginal convolution at its posterior extremity. The lower border of this lobule is bifurcated by an intervening sulcus. The left lobule is not quite so oblique as it normally should be, but the right is nearly vertical, as in the ape.

The *occipital lobule* on the left side approaches the square in shape, and is divided below by a deep perpendicular sulcus, before referred to. It is otherwise perfectly simple. On the right side it is a long simple convolution, wide above, but becoming thinner below, which curves downwards and forwards, running beneath the quadrilateral lobule to join, by a thin band of brain substance, the convolution of the corpus callosum. Owing to the contraction of this part of the right hemisphere, both the quadrilateral and occipital lobules are placed much further forward than normal.

Of the *internal temporal convolutions*, the first on the left side cannot be seen. On the right side, in the open space before referred to, at the posterior part of the lateral ventricle, is a convolution the thickness of a wafer, and marked by a linear depression, which may represent it. It is connected posteriorly with the middle internal temporal. This latter convolution is much better marked on the left side than the right, but on neither side can the crotchet be seen. The lower internal temporal, which is the same as the lower external one, is well marked on both sides; but on the right side it is placed much further back than normal, owing to the contraction of the brain in this region. All these convolutions are simple.

Since the fissure of the hippocampi does not join the internal perpendicular fissure in either hemisphere, the *lower internal connecting convolution* is necessarily absent.

With respect to other parts of the brain, the pons, medulla, corpus callosum, crura cerebri, &c., are all present and well developed, considering the size of the brain. The corpora striata and optic thalami were not examined, in order that the surfaces of the brain might not be disturbed. As before mentioned, the cerebellum is much in excess of the healthy ratio.

Some measurements of the preserved brain were taken:

Left lobe-length (from tip of frontal to tip of occipital convolution).	3 inches
„ „ breadth (from upper end of parietal lobule to middle of third temporo-sphenoidal at widest part)	$1\frac{7}{8}$ „
„ „ height	$1\frac{1}{8}$ „
Right lobe-length (as above)	$2\frac{1}{2}$ „
„ „ breadth „	$1\frac{7}{8}$ „
„ „ height	$1\frac{1}{8}$ „

so that the left lobe is $\frac{1}{2}$ inch longer than the right, while the breadth and height of each lobe are equal.

Frontal lobe, depth	1 inches
„ „ width	$\frac{6}{8}$ „
Length of each orbital surface	1 „
From point of middle lobe to hinder end of brain, each side . . .	$1\frac{5}{8}$ „
Projection of cerebellum beyond cerebrum	$\frac{1}{2}$ „
Cerebellum, breadth	2 „
„ length (in middle line where two lobes of hemisphere diverge)	$\frac{7}{8}$ „
„ depth	$\frac{7}{8}$ „
Greatest transverse diameter of brain	$2\frac{7}{8}$ „

Remarks.—With the exception of the lower internal connecting convolutions and the internal temporal, all are represented, though they are exceedingly simple, many being smooth elevations of cerebral substance, without any evident convolutional folding. The left external temporal show this folding the best, then the right external temporal, both frontal and the left occipital on the base, in the order mentioned.

Some parts are better defined than others; thus, the ascending frontal, and ascending parietal are best seen on the right side, but the occipital convolutions on the left. Both parietal lobules are well marked. The supra-marginal lobule and angular convolution are best seen on the right side, though they are simple on both sides. The island of Reil can scarcely be distinguished. The first external connecting convolution is well marked in both hemispheres: the second is best seen on the right, and the third and fourth on the left. The marginal convolution of the corpus callosum, especially the left, the quadrilateral and occipital lobules, are well defined. The frontal and temporo-sphenoidal have the best definition, and then the parietal and occipital.

Many convolutions are not so highly developed as those in the fœtus at the sixth month in Gratiolet's plates, but they are more advanced than the one of $5\frac{1}{2}$ months. The cerebellum apparently has been developed after that of the cerebrum had ceased, so that there has not been arrest of development at a certain time, but irregularity of evolution.

The chief differences between this and the ape's brain are the marked asymmetry of the two hemispheres, the superficial condition of the four external connecting convolutions, and the absence of the upper internal connecting one seen in this brain. On the other hand, the deficient development of the supra-marginal lobule is important, as it is regarded by Gratiolet as peculiarly characteristic of man.

As to the relation between the state of the brain and the mental and bodily condition, it has been shown that although the brain is so small, the convolutions so simple, certain qualities of the mind, observation, attention, memory, and affection (the latter belonging to the emotional part), were present, corresponding with the

relatively large size of the frontal lobes. The absence of speech is interesting, as the posterior part of the third left frontal convolution, the island of Reil, and the operculum, are very small. Her sight and hearing were good, and the centres governing those parts were well developed. Her power of movement was limited, corresponding with the small size of the ascending frontal and parietal convolutions.

It should be mentioned that in the description of the fissures and convolutions of both of this and the other brains, Marshall's classification has been chiefly followed, and that no microscopical examinations of this brain were made, as the topographical anatomy was considered very important.

E. H., aged six years, was admitted into the Darenth Asylum on January 9, 1879, and died July 29, 1879. She was an illegitimate and the only child. Nothing was known of the father or his side of the family. The mother was a temperate woman, and up to the time of her trouble enjoyed good health; but she became very delicate and died eight months after the birth of the patient. The grandmother of the child was in a lunatic asylum, suffering from "softening of the brain." The mother was in great trouble during the time she was pregnant, and the labour was tedious and difficult. The child had had one slight convulsion before admission. When admitted she was found to be a fairly nourished, dark-complexioned child, two feet $5\frac{1}{4}$ inches in height. Her head was small, measuring $15\frac{5}{8}$ inches in circumference, $9\frac{1}{2}$ inches transversely between each auditory meatus, and 11 inches antero-posteriorly from the root of the nose to the occipital protuberance. Her hair came low down on her forehead, which was $3\frac{1}{2}$ inches in width. She could walk about the ward, had perfect use of her limbs, and during her residence in the Asylum had no epileptic fits. She was of a happy disposition, easily pleased, and was very much attached to her nurse. She noticed what went on around her, was very sociable with the other children, but could not utter a word, though her hearing was good. Her habits were faulty. Though she could pick up and play with objects, she had no idea of feeding herself. She had a fair amount of observation and attention, as well as memory, the latter being shown by the fact that she remembered persons, particularly the nurse and myself. She was kept in the Infirmary during her residence in the Asylum, and did not attend school. Her health continued good up to a few days before death, when pneumonia of the right lung came on, of which she died.

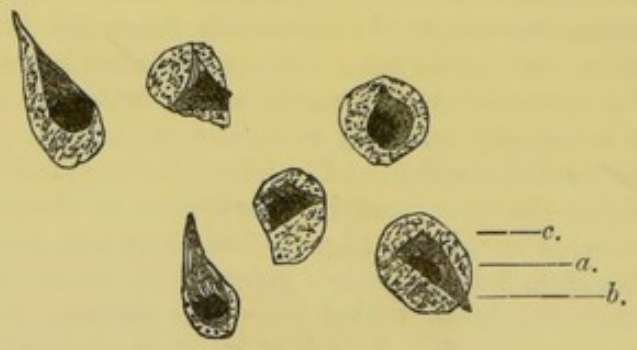
At the autopsy, made forty-eight hours after death, her body was fairly nourished and her legs and arms hairy. The cranium was symmetrical, the sutures well united, but there was flattening of the occipital bone. The dura mater was very adherent, so that the portion covering the convex surface of the brain had to be removed with the calvaria. The brain weighed $20\frac{1}{2}$ oz. The convolutions were simple, but by no means so much so as in many brains of microcephalic idiots. There was no congestion of brain or membranes, and no excess of fluid in the ventricles. After preservation in spirit for one year, the brain weighs $14\frac{1}{2}$ ounces. It is, compared with the preceding brain, very highly organized, although the convolutions are much simpler than in the adult human cerebrum. It is as simple, if not simpler, than the infant's brain, and in shape is a short, rather than the long ovoid usually present. It is in convolutional arrangement very far in advance of the ape's brain, whose shape it does not resemble, for there is no narrowness and want of depth of the frontal region. The cerebellum is not only covered, but slightly overlapped by the hemispheres. The greatest length of the brain, measured from the tip of the frontal to the tip of the occipital lobe, is six inches, and its greatest breadth, situated about the centre, between the Sylvian fissures is $4\frac{1}{2}$ inches. The brain is very small as a whole, but the occipital lobes are very slightly developed. The frontal, parietal, and temporo-sphenoidal are well developed. Supposing the total length of the hemispheres, as seen vertically, to be represented by 100, the part in front of the fissure of Rolando will equal 66, that between the fissure of Rolando and the external perpendicular fissure will equal 27, while the occipital portion will be represented by only 7. In the human brain the proportions are 54, 23, 23. The frontal part is therefore

larger than usual, the parietal about the normal, while the occipital is only a third of the proper size. This occipital shortening probably accounts for the shortness of the brain from before backwards.

The fissures are all present and well-developed. The right Sylvian, however, in the posterior third of its course, takes a sharp turn upwards in an oblique direction. The external and internal perpendicular fissures on the right hemisphere are half an inch posterior to those on the left, and the occipital lobe on the right side is correspondingly smaller. On this side, too, the calcarine fissure is separated from the dentate fissure by a much thinner ridge of brain substance (that connecting the convolution of the corpus callosum with the uncinate convolution) than on the left side. The calcarine joins the internal perpendicular fissure at a very acute angle, especially on the right side, so that the occipital lobule is very small, and the convolutions rudimentary. As to the convolutions, though simple, they are much in advance of some other idiots' brains which I have dissected. The three tiers of frontal convolutions are easily made out, but are differently arranged on the two sides. Thus, on the left side the first frontal consists of one long convolution joining behind the ascending frontal, in front the second frontal and below—about its middle—the same convolution. The second frontal is also a comparatively straight convolution placed immediately below the first, and joining, about its middle, the third, which approaches the triangular in shape, below. On the right side the first frontal is triangular, and joins the ascending frontal in its lower third. The second is placed below, and anteriorly is in front of the first, and is also of a triangular shape; while the third is circular, and is joined below and in front to the second. A deep sulcus, dividing the lower part in two, ascends in the centre of this convolution, and then bifurcates at an obtuse angle. The ascending frontal on the left side is simple, but on the right takes a curious course. About an inch from its commencement it divides into two broad convolutions; the anterior one ascends, and is joined to the posterior part of the first frontal, of which it may be said to form the posterior portion, while the posterior branch passes on in the usual direction of the ascending frontal, and joins the ascending parietal behind. This ascending frontal convolution looks, in fact, like a tree with two branches. The ascending parietal on the left side is very irregular. It is broad below, then becomes contracted, and receives on its posterior concave border the anterior convex border of the supra-marginal lobule, after which it again widens and passes on to be connected with its lobule, which on this side is nearly two inches long. On the right side it is in its whole length rather thin, and its lobule is not so long as the left. On the left side the supra-marginal lobule is very small, but the angular gyrus is of fair size. On the right the lobule is larger, and owing to the ascent of the posterior part of the Sylvian fissure on this side, it curves around its upper end. The angular gyrus is larger, and is posterior to that on the left side. The island of Reil is completely shut in by the sides of the Sylvian fissure on both sides. It is apparently very simple, but, as the brain in its neighbourhood is very soft, it is difficult to make out its outlines. The external temporal convolutions—with the exception of the first—are situated on the base of the brain, and the third is placed further back than usual. The connecting convolutions on the left side are well marked. The third and fourth, in consequence of the situation of the temporal, are lower down than usual. On the right side the first is not superficial in its whole course, but the second is so. The third and fourth cannot be made out, in consequence of the injury to the brain, caused in taking it out of the skull, where they are situated. The occipital lobes, as before mentioned, are small. The marginal convolutions are well marked. On the left side an intervening convolution joins it to the convolution of the corpus callosum about its posterior third. This is not present on the right side, and the posterior part of the marginal convolution is not so broad as usual. The corpus callosum is well formed. The convolution of this body on the right side has a larger crest than normal. The quadrilateral and cuneate lobes are well seen, but that on the right side, as before mentioned, is very small. The crotchets of the unciform convolutions are well marked. The left is the larger of the two.

The orbital convolutions are fairly developed. The cerebellum, pons and medulla are of normal size relatively to that of the cerebrum.

Some excellent microscopical sections of a portion of the frontal convolutions adjoining the orbital ones, were made for me by my friend Mr. Marsh, of the Lincoln County Asylum, and the appearances found were as follows:—In the sections stained with logwood, a large number of leucocytes were seen, both in the grey and white matter, so that under a low power, with which they were best distinguished, only five layers could be made out. In the sections stained with aniline black, the first, second and third layers were most clearly distinguished. The cells were generally round, sometimes pear-shaped, and the nucleus which was round or oval in shape, usually situated in the centre with retracted protoplasm around and externally a space. Occasionally the nucleus was placed at the base. The space was sometimes clear, but more often nearly filled with faintly stained granular matter. Only a few cells had processes, and these were small and stunted. This patient was considerably in advance of the preceding one in intellect, thus corresponding with the better developed brain. As before mentioned, observation, attention,



Cells from third layer of cortex of frontal convolution of E. H., microcephalic idiot. *a.* nucleus. *b.* retracted protoplasm. *c.* granular matter. The retracted protoplasm and granular matter are represented too dark in the wood-cut. Hartnack obj., No. 8, eyepiece, No. 4, tube drawn out. Fletcher Beach, *delt.*

memory and affection were present, and the frontal convolutions it will be remembered were well developed. This child however had perfect use of her limbs, as would be expected from the larger size of the ascending frontal and parietal convolutions in this case. Sight and hearing were good, and the angular and first external temporal convolutions were well marked. As to speech, the third frontal convolutions on both sides were comparatively small, and the island of Reil simple. We must remember in addition, however, that speech depends upon a perfect combination of fine muscular movements, so that not only must the centre from which they proceed be present, but its structure as well as the rest of the brain must be of good quality. In this case the part concerned was deficient in quantity as well as in quality, as shown by the microscopical appearances. The scarcity of processes, and the rounded shape of the cells particularly noticed in this and many other cases of idiocy, may ultimately be found to account in some manner for the deficiency not only of speech, but of ideas, in cases of low type, for if thought and ideas originate in nerve cells, an obstruction to their development would, of course, be caused by imperfect development of the cells, and want of deficiency of communication between them, in consequence of the scarcity or complete absence of cell processes.

Cretinoid Idiocy.—F. R., aged five years, admitted into the Clapton Asylum, October 1, 1875, and died, January 10, 1876, of bronchitis. The parents were healthy, but the father was very intemperate, being so even at times of coition. The maternal grandmother suffered from melancholia for six weeks at the change of life, and the mother was subject to neuralgia. The parents were not connected by consanguinity. The mother ascribes the child's condition to fright and trouble during pregnancy. She was born in London, has always been well fed, and the situation of

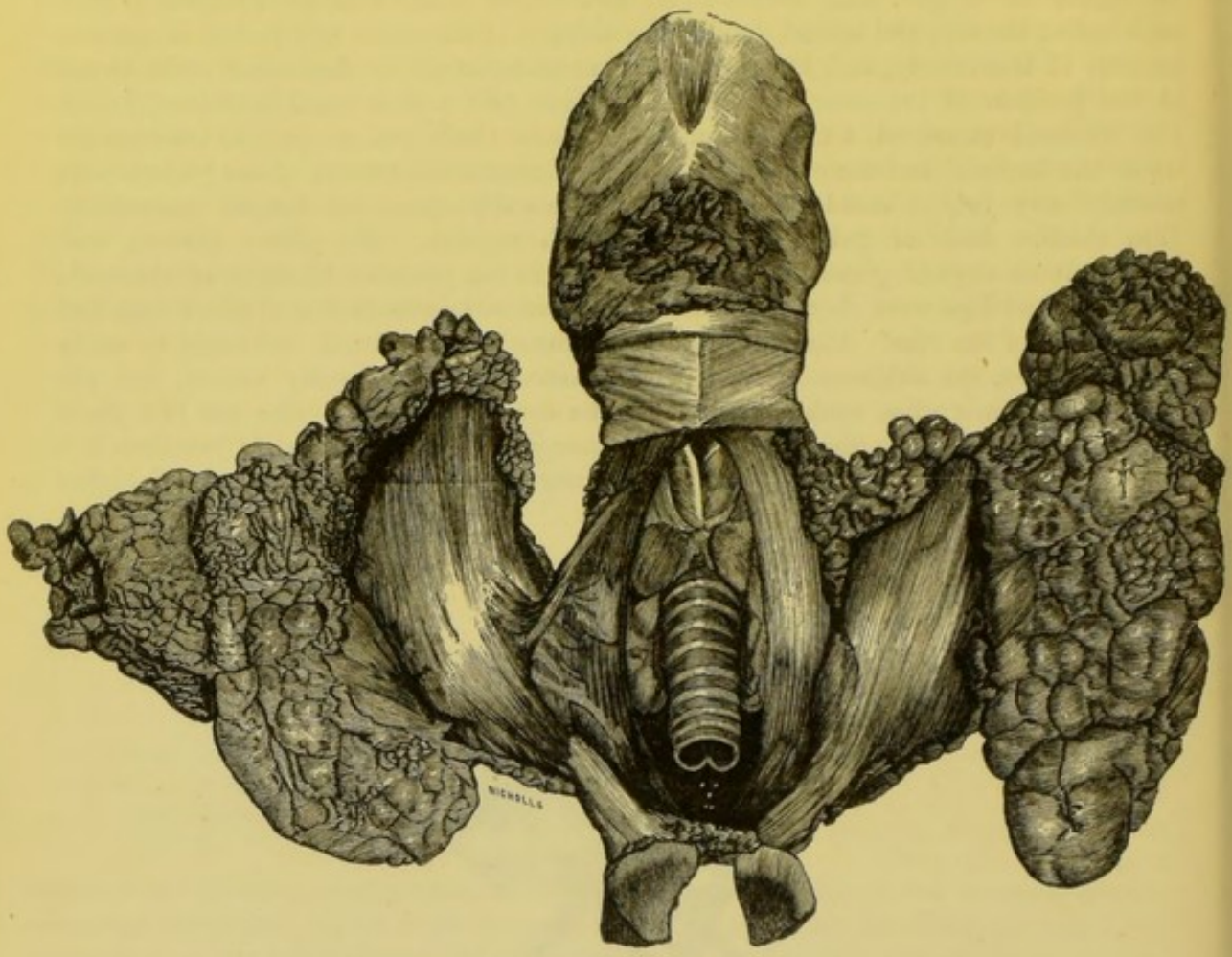
the house is said to be airy. This is the eldest child. Two others have been born one of whom has died, but they present no malformation. The mother had one miscarriage previously to the birth of this one. On admission the child was seen to be a well-marked case of sporadic cretinism, the name given to these cases by Dr. Hilton Fagge. She was well nourished, of fair complexion, with brown hair, 2 feet $6\frac{1}{2}$ inches in height, and weighed 20 lbs. Her head was of an average size, flattened at the top, and spread out at the sides. It measured $20\frac{1}{4}$ inches in circumference, 11 tranversely, and $11\frac{1}{4}$ inches, antero-posteriorly. A depression could be felt in the position of the anterior fontanelle. Her face was, as usual in cretins, broad. Her forehead measured 4 inches transversely, and there was a distance between the tip of the forehead and the chin of $5\frac{1}{4}$ inches. Complexion sallow. Nose pug-shaped; scarcely any bridge could be felt. Mouth usually open, and tongue protruding. Lips thick. Arch of palate flattened. Teeth regular. No goitre present, and apparently no thyroid gland, but fatty swellings in the posterior triangles of the neck. The arms and legs were short and curved. There was some fulness of the wrists, but no bending of the ribs. Her skin was much smoother than usual, and could be easily separated from the subjacent tissue. Her countenance was usually vacant, but she would often smile when spoken to, though she could not speak. She was of a placid and quiet disposition. She could not stand nor walk, but spent most of her time in a chair. She noticed what went on in the ward, and generally seemed of higher

Cretinoid Idiot.

intelligence than another cretin who lived in the same ward with her. At the autopsy, the anterior fontanelle was found to be widely open, and there was a depression in front of it. The sutures were fairly united, their line of union being evident by congestion. When the calvaria and brain were removed and the base of the skull examined, it was found not to present the changes seen in the case of E. R. S., reported by myself, in the Pathological Transactions of London, 1876, in which the foramen magnum was seen to be smaller than usual and surrounded by an elevated ridge, the basilar process horizontal and narrowed laterally, and the cerebellar fossæ flattened. In this case the foramen magnum was of normal size, and there were very slight ridges around it. The clivus, or inclined plane, formed by the union of the basilar process of the occipital with the sphenoid bone, was very steep, thus corresponding with the case reported by myself, in the *Journal of Mental Science*, July, 1876.

The brain weighed 38 ounces. The convolutions were of normal size, differing from the two cases just alluded to, in which they were coarse (in one case $\frac{1}{2}$ in., in the other from $\frac{3}{8}$ in. to $\frac{1}{2}$ in. in width). The posterior lobes slightly overlapped the cerebellum. The ventricles were of normal size and contained no excess of fluid. Septum lucidum perfect. The brain was not at all reduced in size, and, to the naked eye, appeared healthy. The trachea showed no sign of a thyroid gland, but

on the outer sides of the neck were two fatty tumours, small in size, pinkish in colour, and lobulated, without any investing envelope, sending processes upwards and backwards, beneath the sterno-mastoid muscles, and downwards beneath the clavicles.



In the centre is seen the trachea with the sterno-hyoid and thyroid muscles turned aside. Outside these are the sterno-mastoid muscles and still externally are the fatty tumours.

P. C., aged fifteen years, admitted into Clapton Asylum, May 14, 1875, and died January 31, 1878. His father was a delicate man, who is said never to have been very sharp, and who worried himself a good deal about trivial matters. His mother, a Dutch woman, was generally healthy, but suffered from bad headache at times. There is a history of phthisis in the family of the parents, who were temperate, and not connected by consanguinity. No family history of neuroses. The conformation of the boy's body is said to have existed, as now seen, at birth. The mother did not suffer from trouble during pregnancy. The patient fell on his head when six months old, but did not become insensible. He is the second son; there are seven others, all healthy, presenting nothing remarkable about them. On admission he was seen to be an idiot of the cretinoid type, but not of so marked a character as the preceding or succeeding case. His complexion was muddy. He was 4 feet $5\frac{1}{2}$ inches in height, with a square head, measuring $21\frac{3}{4}$ in. in circumference, 13 in. in the transverse direction, and 15 in. antero-posteriorly. There was no sign of paralysis, but he was very slow in his movements. He did not suffer from epilepsy. He was able to speak, but did not say much. He was very pugnacious, continually fighting with the other boys. On both sides of the neck were fatty tumours, and correspondingly there was an absence of the

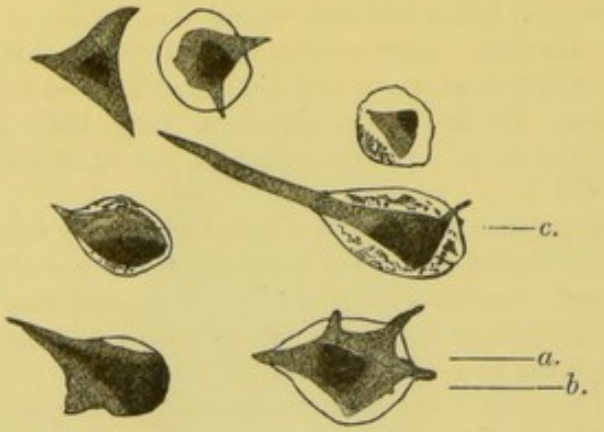
thyroid gland. He went to school in the asylum, but was very lazy and dull. An attempt was also made to teach him the trade of a shoemaker. At the end of 12 months he could spell "cat," "go," "to," could count to 7, and from 9 to 15. He knew the names of, and sometimes would distinguish, a colour. He had made no improvement in the shop. After another year's training, that is, at the end of 2 years, he could spell one or two more words and add 1 and 1, count to 12, and distinguish the blue and red colours. He had made, therefore, very little progress in school, as was also the case in the shop. He continued in the same state, and died of pneumonia, January 31, 1878.

At the post-mortem the body was found to be very fat. The cranium was thicker than normal, and the interior of the skull-cap, which was eburnated, was closely attached to the dura mater. The brain weighed 2 lbs. 15 oz., and was, therefore, of average weight. The convolutions, though more highly developed than in the second case of microcephalic idiocy, and the other two cases of cretinoid idiocy, were yet simpler than normal. The sulci were well marked. On further examination the fissures were found to be all present, and the convolutions of some degree of complexity. It is presented for inspection by the Members of the Congress.

On examining the trachea, some fat was found at the lower and front part of it, communicating on each side with lumps of fat, not encapsuled, in the posterior triangles of the neck.

F. T., aged nine years, was admitted into the Darenth Asylum, February 12, 1880, and died June 8, 1880, of pneumonia. The father died of inflammation of the lungs six months before the patient's admission. He had been a temperate man before the birth of this child, but three years ago took to drink. The mother was a temperate, healthy woman. There was a history of phthisis on both the father's and mother's side; a paternal aunt had died of epilepsy, and the mother had fits as a child. The paternal grandfather was paralyzed. Hereditary predisposition, therefore, not certainly to cretinism, but to an unstable brain, was markedly present. No history of consanguinity. The child is said to have had nice features up to two years of age, and, when fifteen months old, could walk round a chair, and was able to say a few words. As the result ofwhooping-cough when one year and eight months old, she lost the power of talking and walking. She was noticed to get fat when two and a half years old, and has been getting fatter ever since. She seemed to stop growing when seven years old, and has not grown an inch since. The cause of the child's condition is assigned by the mother to a fright by an insane gentleman during her pregnancy. It must, however, be stated that the mother lived, and the child was born, in a valley which was foggy and marshy, and the soil very chalky. On admission, the child presented the usual signs of a sporadic cretin as related in the case of F. R. The circumference of her head measured $19\frac{3}{4}$ in., transverse diameter $12\frac{1}{2}$ in., antero-posterior 13 in., width of forehead 4 in. She was 2 feet $6\frac{1}{2}$ in. high, and unable to stand, though she could move her legs. She could hold things, but not move herself about. Her hearing was dull, and she could not utter a word. Disposition placid and quiet. She was unable to swallow solids. She noticed me when I paid her my morning visit, but otherwise did not take much notice of what went on in the ward. At the autopsy, the cranium was found to be square in shape, and the sutures well united. There was a steep descent of the clivus, as in the case of F. R. The brain weighed 36 ounces. The convolutions were rather simple. Some admirable sections of this brain were also made for me by my friend Mr. Marsh. In the logwood stained sections, a large number of leucocytes were noticed, as in the microcephalic idiot, and five layers of nerve cells were made out both in these and the sections stained with aniline black. The cells were larger than in the case referred to, and the spaces also. In shape, they (the cells) were round or pyramidal. A few were without spaces, and these had an irregular, angular appearance. More of the spaces were clear than in the case of E. H., and those not clear presented faintly stained granular matter. The nuclei were round, oval, or irregularly angular. Many of the cells had no processes, some only one

and a few had three or four, but the processes in each case were stunted. Owing to the number of cells, with large spaces, a curious honeycomb appearance was produced.



Cells from third layer of cortex of frontal convolution of F. T., cretinoid idiot. *a*. nucleus *b*. retracted protoplasm. *c*. granular matter. The retracted protoplasm and granular matter are represented too dark in the woodcut.

Hartnack, obj. No. 8, eyepiece No. 4, tube drawn out. Fletcher Beach, *delt*.

Cases of cretinoid idiocy are known by the peculiarity of their features, their stunted growth, usually the absence of thyroid gland, and generally the presence of fatty tumours in the posterior triangles of the neck. They are usually of a placid and quiet disposition, and although the boy P. C. was pugnacious, yet he was noticed when in school to be dull and lazy.