Degeneration and atrophy of the cerebrum.

7

DEGENERATION AND ATROPHY OF THE CEREBRUM.

The following case is so interesting in many of its features, and so important in the character and site of the lesions found after death, that after a careful and thorough investigation of its peculiarities, I have considered it worthy of being put on record *in extenso*.

History.—J. M., æt. 32, a vagrant, was admitted into the Durham County Asylum on the 9th April 1863. No insanity or nervous disease is admitted to have existed in the family of either parent. Father and mother both possessed strong constitutions and good health, and were free from any nervous disease, eccentricity, or vice. Former died in 1841, æt. 51, of heart disease. The latter, up to the period of his admission, wandered about with the patient, begging, and using him as a means of exciting commiseration; she is 63, enjoys tolerably good health, is active, and of average intelligence. J. was the second of nine children, six of whom are said to have died in infancy, of convulsions. He appears to have been healthy, strong, and intelligent up to the age of 13, an apt learner, of sound faculty, and average strength of mind. At that age he had a severe attack of typhus fever, which left him demented and epileptic. His condition has never improved, but rather declined; fits becoming more frequent and severe, and imbecility more profound. He has been quite incapable of taking care of himself; of expressing himself rationally; hardly able to articulate a word; tolerant of considerable physical exertion and discomfort; tractable and well-tempered, except when hungry. He appears to have been fond of his mother, to whom he looked for the gratification of the only desires he possessed,—namely, for food and tobacco. He was also fond of children. He appears to have been unable to understand anything said to him, to observe any object, or to know or remember any names, except "mother," "pipe," "tobacco," and "bread." When irritated, he manifested considerable ferocity, biting, scratching, kicking, etc. His mother says that he has been always well fed, and never starved beyond the want of an occasional meal. Violence to his mother was the immediate cause of his being sent to the asylum. He was admitted in a state of great raggedness and filth.

On admission, a systematic examination was made, with the following results:—

1. *Physical Peculiarities.*—Height, about 5 feet 5 inches; development of body good; bones large; muscles not bulky; limbs well formed; cavities ample and symmetrical; habit of body slovenly; stoops, and stands awkwardly; bodily condition low. Cranium

small in every dimension, but symmetrical and proportionate; skeleton of face strong; superciliary ridges and cheekbones prominent; jaws large; ossa nasi well developed; palate broad; teeth large, regular, and well shaped, several decayed or lost; posterior molars of upper jaw imperfectly developed; a greater amount of decay in the teeth of the upper than the lower jaw, and on the left than right side. Ears very large; peculiar in shape, and unequal in size; left ear larger than the right in every dimension; its axis also more oblique; cartilage of pinna hard; dilated capillaries visible on the surface. Eyes deeply placed in orbits; aperture small; lids normal; conjunctiva and cornea healthy; irides hazel; pupils equal, regular, and moderately dilated. Skin wrinkled; complexion coarse; facial capillaries dilated; no dragging of features to any side; hair coarse and red; testes small,—right smaller than left.

2. *General Health* and function of body good; appetite voracious; digestion and assimilation good; circulation feeble; heart and lungs found healthy on physical examination.

3. *Mental Peculiarities.*—Mental condition generally of a very degenerate character; faculties rudimentary, and ill developed.

A careful analysis gives the following result:—

I. *Presentative Faculties.*—Patient appears to acquire and retain a very imperfect, vague, and general impression of objects, persons, and events, with which he is and has been in relation. The number of these which stimulate to any kind of manifestation, or operate as motive to action, awaken desire, exertion, or emotion, are very few, and these are familiar, immediate, and in intimate relation with his body and its requirements.

1. *Sensation* is normal all over the body, apparently neither exalted nor depressed over any particular area. Titillation, pinching, or infliction of discomfort or pain, cause emotion, and effort to escape; no resentment, unless severe.

2. *Senses*, except that of vision, seem to be healthy. Is short-sighted; impressions conveyed by his senses don't appear to produce any interest. He does not energize to bring them in relation with objects, and is not stimulated by any except those relating to his immediate wants, bodily safety, and comfort, or impressions of a violent and unusual kind.

3. *Perception* appears to be limited as to subject, and vague as to character. Does not appear to entertain any definite knowledge of any object, person, or occurrence, which he has not been habituated to by intimate association and constant repetition.

4. *Attention and Apprehension* are almost wanting. If spoken to calmly he gives no heed,—neither seems to understand, nor attempts any kind of response. Loud talking simply excites emotion. A few words he seems to understand the meaning of, or associates with them some pleasure, significance, or kind of sensation.

5. *Memory* seems to be totally absent. There is no evidence of its existence. He does not even remember the way to the water-

closet, though frequently brought to it. Meal-times, and hours of rising and going to bed, he is equally unconscious of. Certain impressions arouse or stimulate a certain desire or manifestation which resembled what he had given vent to before. This is all that can be called memory.

II. *Ideation*, or the process of thought, appears to be quite wanting. He does not say or do anything to any purpose, except feed himself, when food is placed before him. No new impression begets new expression or manifestation of any sort. (He has subsequently been heard to say that "his mother had gone with another man;" this was probably learnt from others, and was repeated whenever his mother's name was mentioned.) He seems to possess no notions, and comparison, abstraction, generalization, conception, imagination, and judgment are quite out of question. Volition is feeble and hesitant.

III. The *Representative Faculties* are very rudimentary. Representations simple, few in number, and general.

1. His *Posture* is peculiar. He sits somewhat crouched, and leaning forwards; his shoulders bent, head thrust forward, and face raised, turned a little towards the left; arms flexed. He stands in an awkward position, legs bent, and feet placed far apart.

2. His *Gestures and Motions* are slow, slovenly, and feeble. He is generally torpid. Mode of walking clumsy; left foot seems to be dragged. He has no repeated gestures or gyrations.

3. His *Expression* is singularly meaningless. The only variations it is capable of are expressions of emotion, anger, joy, satisfaction, pain, etc. His eyes are half-closed, eyebrows drawn together, and upper lip raised in a sort of insignificant grin.

4. *Speech* is limited to a very few words and fragments of sentences, which are uttered occasionally.

IV. *Habits and Conduct.*—His existence generally was found to be almost purely vegetative. He was inoffensive and passive, submitted to the processes of cleaning, dressing, and undressing, etc., without murmur. He fed himself when meat was set before him, holding his spoon in a peculiar way. His desires were few, namely, for food, defæcation, tobacco, and sleep; if these were satisfied, he was perfectly content. He conceived no attachments or antipathies, and did not incline to exert himself. Once or twice, when annoyed, he became savage, and attempted to bite and kick, but not to strike. He indicated when he wanted to go to the water-closet, but could not find his way thither. He asked for tobacco, and would take a pipe from any patient smoking beside him. He never became excited, or gesticulated, the only acute manifestation observed being the expression of rage above noted. He seemed pleased to see his mother when she visited him, but did not evince any active emotion. He seldom wetted or soiled himself.

Progress and Termination.—Very shortly after admission he was observed to take fits, which were of two sorts.—1. Slight verti-

ginous seizures, without convulsions, occurring as he sat or stood, and sometimes occasioning a fall, and frequently accompanied by slight dragging of features and turning of face to the right side. They were of very short duration, required close observation to detect them, recurred sometimes in rapid succession, and were soon recovered from. 2. True epileptic paroxysms, of varying severity, going through all the stages of unconsciousness, tonic spasm, clonic spasm, and coma. The contractions and spasms were observed to involve only the right half of the body, and all its muscles. He generally fell on the right shoulder, never on his face. The duration was short, and recovery rapid. During the early part of his residence fits were comparatively unfrequent, being mostly of the first description. He was benefited by the administration of stimulants, ether, ammonia, etc., when slight fits succeeded each other frequently. Latterly, the severer form became more common, and he averaged three or four daily.

His mental condition and conduct continued exactly as described. He became stouter and ruddier, and, with the exception of a slight attack of diarrhœa, enjoyed uniform good health.

1*st September*.—Began to take fits at 9 A.M., and had an uninterrupted succession of them till 5 P.M. They recurred with great regularity at an interval of a very few minutes. The convulsions were limited to the right side of the body, on which he lay. Pulse rose to 144 beats per minute; breathing became rapid. Face flushed, and grew livid. He became very hot, and perspired. Intervening coma very profound. The course of a fit was as follows:—He manifested a little uneasiness; eyes turned to the right; right brow was raised; mouth dragged to right side; face paled, and pulse became feeble and irregular. The right arm was now raised, pronated, and flexed; the thumb being included in the fingers; the right leg was also raised and flexed; breathing was interrupted, and consisted of a few gasps. Eyes and facial muscles twitched slightly, then the arms, and then the legs. The spasms became more severe, and by degrees subsided by becoming less frequent. Face flushed and grew very livid. He frothed at the mouth, drew a deep sonorous breath, snored, and whiffled, until he was again seized. The pulse was now full, regular, and rapid, 140 to 160.

The means employed consisted of—1. Subcutaneous injection of M. iij. Tinct. Verat. virid.; and, 2. Terebinthinate enemata. These measures have been found of signal benefit in other similar cases. The former did not produce its full physiological effect —(vomiting and reduction of rapidity—not force—of circulation). The instrument was broken, and it could not be repeated. He was much exhausted towards afternoon. He continued free of fits till 10 A.M.

2*d*.—Fits have occurred very frequently during the night, and still occur with short interval and great severity. Pulse 108, weak

and fluttering; respires very rapidly. Exhaustion progressing. To have Tinct. valerian co., 3j. every two hours. Seemed to be rather restored by this drug, and took a little beef-tea. Fits succeeded each other rapidly during the whole day. He became manifestly weaker after each.

3d.—No interruption of fits during the night. Continue to seize him every few minutes. Pulse 72, hardly perceptible. Respiration 48, stertorous. Vital activity declining rapidly.

Lingered on till 4 P.M., when he died, immediately after a fit, of pure exhaustion.

A Post-mortem Examination was held during the afternoon of the succeeding day.

I. *External Appearances.*—Body well nourished; deep lividity on dependent surfaces of trunk and limbs; post-mortem rigidity present in slight degree; cutaneous veins distended all over the surface; patches of congestion on thorax; right arm pronated, flexed, and rigid; thumb included within the fingers; no cicatrix, bruise, or surface abnormality.

II. *Cavities and Contents.*—1. *Cranial*—(*a.*) Scalp thick and congested, adhered more closely than usual to the surface of the skull; (*b.*) Surface of cranium smooth; ramiform congestion seen in patches; cranium short, narrow, and low; deficient in every dimension, but symmetrical and well shaped; sutures well closed; no hollow or ridge along their line; bone much thickened; greatest thickness $\frac{1}{2}$ inch, smallest $\frac{3}{16}$, average $\frac{5}{16}$. No condensation; diplöe and internal surface much congested; osseous development strong; processes and prominences well pronounced.

Capacity of cranial cavity very small. Measurements at the plane of division gave the following result:—Length, $6\frac{1}{2}$ in.; breadth, at 1 in. distance from inner frontal edge, $3\frac{7}{16}$ in.; at 2 in., $4\frac{1}{4}$ in.; at 3 in., $4\frac{9}{16}$ in.; at 4 in., $4\frac{9}{16}$; at 5 in., $3\frac{3}{4}$ in. Greatest breadth, at $3\frac{1}{2}$ in., $4\frac{11}{16}$. in.

The occipital depressions were unequal, the left being the deeper. The cerebellar hollows were symmetrical and deep. The fossæ of the middle lobe were also unequal.

An accurate cast was taken of the interior of the cavity, which gives the following results when compared with another of the cranial cavity of a well developed subject, J. H.

The following measurements show their respective size and capacity:—

		J. M.	J. H.
1.	Horizontal circumference of whole mass, .	$17\frac{1}{4}$ in.	20
2.	... ... of right lobe, .	$8\frac{1}{4}$ "	$10\frac{1}{4}$
3.	... ... of left lobe, . .	9 "	10
4.	Vertical (transverse) of whole, . .	$14\frac{3}{8}$ "	16
5.	... ... of right lobe, .	$7\frac{1}{8}$ "	8
6.	... ... of left lobe, . .	$7\frac{1}{8}$ "	8
7.	... (ant. post.) of right lobe, .	$11\frac{1}{8}$ "	13
8.	... ... of left lobe, . .	$11\frac{3}{4}$ "	$12\frac{3}{4}$
	Amount of water displaced, ...	30 oz.	56 oz.

A series of transverse diameters at a similar level of each, namely, a horizontal plane passing through the most advanced points of the occipital and frontal lobes, and measured from points at inch distances on the circumference with callipers, gave the following result, commencing anteriorly:—

		J. M.	J. H.
1.	...	$3\frac{3}{8}$	$3\frac{7}{8}$
2.	...	$4\frac{1}{8}$	$4\frac{1}{4}$
3.	...	$4\frac{1}{8}$	5
4.	...	$4\frac{3}{4}$	$5\frac{7}{16}$
5.	...	4	$5\frac{1}{4}$
6.	...	$2\frac{3}{4}$	$4\frac{1}{4}$
7.	...	0	$3\frac{1}{8}$

The outline of this plane was more ovoid and pointed at each end in the case of J. M.; the frontal extremity being in the other subject blunt and broad.

		J. M.	J. H.
Long diameter of right hemisphere,		$6\frac{1}{8}$ in.	$6\frac{7}{8}$
... of left hemisphere,		$6\frac{3}{8}$ "	$6\frac{3}{4}$
From point of occipital to point of middle lobe,	right side,	$4\frac{3}{4}$ "	$5\frac{3}{8}$
... ...	left side,	$5\frac{1}{4}$ "	$5\frac{1}{4}$
From point of frontal lobe to most posterior surface of cerebellum,	right side,	$5\frac{7}{8}$ "	$6\frac{1}{4}$
... ...	left side,	$5\frac{7}{8}$ "	$6\frac{1}{4}$

Vertical radii taken from the hollow formed in the cast by the posterior clinoid processes to points at 1 in. distances of the greatest vertical circumference of each hemisphere gave the following result, commencing anteriorly at the point of the frontal and ending at the point of the occipital lobes:—

		J. M.		J. H.
		Right.	Left.	Right and left.
1.	...	$2\frac{1}{4}$	$2\frac{1}{4}$	$3\frac{1}{8}$
2.	...	$2\frac{3}{16}$	$2\frac{7}{8}$	$3\frac{1}{8}$
3.	...	$2\frac{3}{16}$	$2\frac{5}{16}$	$3\frac{5}{16}$
4.	...	$3\frac{1}{8}$	$3\frac{3}{16}$	$3\frac{7}{16}$
5.	...	$3\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{11}{16}$
6.	...	$3\frac{3}{16}$	$3\frac{3}{16}$	$4\frac{1}{16}$
7.	...	4	4	$4\frac{5}{16}$
8.	...	4	4	$4\frac{5}{16}$
9.	...	4	4	$4\frac{3}{16}$
10.	...	$3\frac{9}{16}$	$3\frac{7}{8}$	$4\frac{1}{4}$
11.	...	0	0	$4\frac{1}{8}$
Post. point of cerebellum,		$3\frac{3}{8}$	$3\frac{3}{8}$	$3\frac{1}{4}$

These figures sufficiently explain themselves. On comparing the profile of the two casts, the greater acuteness of the frontal extremity, the more circular outline of the smaller cast, and the very slight projection of the occipital lobe beyond the cerebellum, are the most remarkable circumstances. In J. M. the right occipital lobe did not project so far back as the left.

(*c.*) Dura mater slightly adherent to internal surface of cranium; membrane much thickened, especially over the Sylvian fissure, where it was $\frac{1}{8}$ in. in thickness. The longitudinal sinus was occupied with firm fibrinous and dark sanguineous coagulum. It was penetrated abundantly on each side of this sinus by arachnoidean villi. A small quantity of fluid existed beneath the membrane.

(*d.*) The arachnoid was considerably opacified. A large amount of sero-gelatinous fluid existed beneath it. This was collected into two deep wells over the frontal and occipital lobe of the right side, and a third collection of fluid existed on the left frontal lobe, oppo-

site to the more anterior of the former: no convolutions could be seen here. Adhesions existed between the applied surfaces in the mesial fissure.

(*e.*) The pia mater was much congested, both arteries and veins being distended with dark blood. Distribution and coats of both healthy.

Carotids quite healthy; equal in calibre; equally filled with blood, and giving off the same number and size of branches. Basilar artery large; vertebrals equal and well sized. Ventricles contained little serum; structures displayed on opening them healthy.

Commissures normal; soft commissure large. The posterior cornu on each side ran deep into the posterior lobe of the brain, curving inwards beyond the internal perpendicular fissure. Hippocampus minor, corresponding internally to the included convolution of that fissure large and prominent. Corpora striata and optic thalami equal in size and normal in structure. Hippocampus major normal.

(*f.*) The whole cerebral mass weighed	34½ oz.
The cerebellum pons and medulla oblongata together,	6¼ "
Cerebrum, ...	28¼ "
Right lobe of cerebrum, ...	13¼ "
Left, ...	15 "
Each lobe of the cerebellum weighed, . . .	2¼ "
Whole mass of cerebellum, ...	4½ "

The following proportions result from these figures:—

Cerebellum, pons varolii, and medulla oblongata to whole mass, ...	as 1 to 5·5
The same structures to the cerebrum, . .	as 1 to 4·5
Cerebellum to whole mass, ...	as 1 to 7·7
... to cerebrum, ...	as 1 to 6·3
... to right lobe, ...	as 1 to 2·9
... to left lobe, ...	as 1 to 3·4

The convolutions of the *cerebrum* were much atrophied. Those of the middle lobes and basal aspect were well sized, the superior frontal and occipital gyri being excessively wasted. The nature and extent of this atrophy will appear from the more detailed description of the convolutions given below.

The substance of the brain seemed to be healthy. The *cerebellum*, which was examined with very great care, was found to be normal in size, weight, configuration, and structure. The surrounding membrane was congested, and vessels throughout the organ dilated.

The pons varolii, medulla oblongata, and cerebral nerves were found to be exceedingly healthy.

2. *Thoracic Cavity.*—Capacity and configuration good. Cartilages of ribs not ossified. Very slight pleural adhesion on left side, more general and firm adhesions on right side. A small quantity of sanguineous fluid existed in each pleural cavity.

(*a.*) The right lung weighed 26 oz. Its lobes were glued to each other; middle lobe small. Anterior edge very emphysematous.

Posterior portion of upper and whole of lower lobe strongly congested and solidified, with occasional apoplectic patches. Substance dense; colour deep red. A frothy sanguineous fluid oozed off the surface. The vessels emitted a dark fluid, and a red froth issued out of the bronchi, which were of a deep colour internally. The lung was much pigmented, and a few cretaceous and caseous nodules existed in the apex.

(*b.*) The left lung weighed 22 oz. Its condition was in every respect similar to that of the right lung.

(*c.*) The pericardium was healthy. There was a good deal of fat deposit around the heart, which was moderately distended. The right cavities contained a firm fibrinous clot and small quantity of dark blood. Valves healthy; walls thin, composed mainly of fat. Left cavities more contracted, contained also a small amount of fibrinous clot. Valves healthy. Posterior flap of mitral valve rather atrophied. Walls fatty. No atheroma of aorta. Organ weighed 11 oz.

3. *Abdominal Cavity.*—Walls of abdomen contained a considerable amount of fat, subcutaneous and subperitoneal. Peritoneum healthy, and omentum and mesentery contained a large amount of fat. Appendices epiploïcæ of considerable size.

(*a.*) *Stomach, etc.*—Small and large intestine healthy and moderately filled. No accumulation of fæces. A terebinthinate odour could be perceived as far as the cœcum. Mesenteric glands healthy.

(*b.*) *Liver* weighed 46 oz., very fatty and considerably congested.

(*c.*) *Spleen* weighed 6 oz., firm and healthy.

(*d.*) *Kidneys* weighed each 4½ oz. Configuration and structure healthy; slightly degenerated around the base of the pyramids. Supra-renal capsules and pancreas healthy.

Anatomy of the Cerebral Convolutions.—In describing more minutely the anatomy of the cerebral convolutions, I shall follow the system and nomenclature of Gratiolet,[1] which, if not the most philosophical and simple possible, is at any rate the best known and most frequently employed.

I. The *Central Lobe*, or island of Reil, which occupies the floor of the Sylvian fissure (S), and interdigitates with the columns of the marginal convolution of this fissure, is almost exactly symmetrical, and of normal size and shape. It seems to be rather more superficial and easily seen in the fissure than in a well-developed brain.

II. *Temporo-Sphenoidal Lobe.*—This lobe is also large; its convolutions well sized and rounded; its sulci deep; and the symmetry easily discernible. It consists of five convolutions, starting from a common origin at the point of the middle lobe, and diverging somewhat, proceeding backwards and upwards to join convolutions of the occipital lobe. They are arranged circularly and communicate by digitations, and by both sunk and superficial *plis de passage.* They are:—

[1] Memoire sur les Plis Cerebraux de l'Homme et des Primatès.

1. *Superior Temporal Convolutions* (plis marginaux superieurs, 7, 7, figs. 1 and 2), forming the posterior lips of the Sylvian fissures, are very symmetrical, and terminate by joining the lobules of the *marginal* convolutions (A, A, figs. 1 and 2).

2. *Middle Temporal Convolutions* (8, 8, Figs. 1 and 2).—These convolutions are broader—are limited on each side by deep sulci—and become deeply indented by sulculi as they ascend, becoming broader and split up into several gyruli. The most anterior of these are the curved convolutions (Plis courbès, 6, 6, Figs. 1 and 2). The more posterior join the occipital convolutions, and form the third and fourth so-called *plis de passage*, where they connect the two lobes (γ, δ, Figs. 1 and 2).

3. *Inferior Temporal Convolutions* (9, 9, Figs. 1, 2, 3, and 4) arise in common with the preceding, and run parallel with these along the base of brain, reaching to the occipital lobes, and becoming continuous with some of their convolutions. They are bounded on each side by sulci; those of each side symmetrical and unatrophied.

4. *Internal Temporal Convolutions* (6, 6, Figs. 3 and 4).—These are smaller than the last, and do not reach the point of the lobes, ending in a point or joining those above it.

5. *Middle Internal Temporal Convolutions*, or *Lobule of the Hippocampus* (5, 5, Figs. 3 and 4).—These are the most superior internally; are bounded above by the fissures of the hippocampi, and end at the point of the occipital lobes. They are large, symmetrical, and well developed.

III. *Occipital Lobe.*—The convolutions constituting this lobe are considerably narrower in the right hemisphere, the superior being atrophied. They are, in reality, short curved convolutions crossing transversely between the widened extremities of the temporal convolutions. On the internal face of the lobe, between the internal perpendicular fissure and the fissure of the hippocampi, is a triangular mass of small convolutions—*the internal occipital lobule* (3, 3, Figs. 3 and 4). This is also smaller on the right side.

IV. *Parietal Lobe.*—This lobe consists of two convolutions (first and second ascending), two lobules, the lobule of the second ascending, and marginal: the curved convolution, and several smaller annectent convolutions, or *plis de passage*.

1. *The First Ascending Parietal Convolution* (4, 4, Figs. 1 and 2), lying in front of the fissure of Rolando (R, R, Figs. 1 and 2), and extending upwards and slightly backwards from the margin of the Sylvian fissure to that of the great mesial fissure, is decidedly narrower, more plicated, and shorter on the right side. Otherwise, they are very symmetrical.

2. *The Second Ascending Parietal Convolution* (5, 5, Figs. 1 and 2), lying behind the fissure of Rolando, and running parallel to the last, is also less massive on the right side.

Its *lobule* (5′, Figs. 1 and 2), formed by the junction of a process from its posterior surface, near the superior extremity, and an

annectent or bridging gyrulus, or *pli de passage*, from the apex of the marginal lobule of the Sylvian fissure, is also more insignificant on the right hemisphere.

3. *The Lobule of the Marginal Convolution of the Sylvian Fissure* (A, A, Figs. 1 and 2), which is in reality the plicated bend of that convolution at the apex of the fissure, is less bulky on the right side, and reaches nearer the margin of the hemisphere (about $\frac{3}{4}$ in.).

4. *The Curved Convolutions* (6, 6, Figs. 1 and 2), proceeding from the posterior aspect of this lobule, and bending sharply round the apex of the *scissure parallel*, becoming continuous with the middle temporal gyrus, are very equal, symmetrical, and comparatively well developed.

5. *The Annectent Bridging Convolutions*, or *Plis de Passage*, are as follows:—(*a.*) A small, short gyrulus proceeding from the lobule of the marginal convolution to that of the second ascending. This is superficial, well developed in the left hemisphere; short, shrunk, narrow, low, concealed, hard, yellow, and devoid of nervous matter on the left. (B, Figs. 1 and 2.)

(*b.*) A similar gyrulus close to the last, passing from the apex of the *pli courbè* to near the insertion of the last. An exactly similar contrast obtains in this case. (B, Fig. 1.)

(*c.*) A deep, narrow convolution (α, Figs. 1 and 2) separating the internal (I, I, Figs. 3 and 4) from the external perpendicular fissure (P, P, Figs. 1 and 2), and connecting the parietal and occipital lobes along the margin of the hemisphere, more strictly the quadrilateral lobule, and the internal occipital (1 and 3, Figs. 3 and 4). This on the left side is full, round, soft, superficial, though rather narrow. On the right it is a simple transparent fibrous lamina, without a vestige of nervous substance. It is not superficial.

(*d.*) A broader convolution (ξ, Figs. 1 and 2), passing below and rather behind the latter, from the *pli courbè* to the occipital lobe. On the left side it is broad and full; on the right, hard, contracted, low, and narrow, in a state of degeneration, wasting, and induration, similar to the rest on this side. Two gyruli below this form the remaining *plis de passage* (δ, Figs. 1 and 2).

V. *Frontal Lobe.*—This most important lobe consists of a series of narrow convolutions, extending between the marginal convolution of the fissure of Sylvius and that of the hemisphere. There is more want of symmetry in their number and distribution in man, than of any other portion of the brain. They have been divided artificially by Gratiolet into three stages, and in the lower brain this is easily verified, but in man the arrangement seems to be this,—that a variable number of narrow *plis de passage* run obliquely upwards and forwards from one marginal convolution to another, and are connected themselves by a series of annectent gyruli, the most posterior of these coming from the first ascending parietal.

On general comparative inspection, the sharpness, smallness, and

narrowness of the right frontal convolution is most remarkable Both are much atrophied, the middle and superior stages most completely; but on the right side this condition is extreme, and in place of the superior stage, a hollow exists, with small, hard, cord-like convolutions running along its floor.

The orbital lobule (1′) and superior portion of the superior frontal stage (3′, Figs. 1 and 2) may be considered as a portion of the marginal convolutions of the hemisphere and great mesial fissure (external aspect of 2, 2, Figs. 3 and 4), and are not much affected; the latter being atrophied slightly on the right side. The character of the remaining ridges is minutely exhibited in the following description, commencing posteriorly :—

1. *First Frontal Ascending.* (3, Figs. 1 and 2.)

RIGHT SIDE.

The convolution on this side has two roots, one proceeding from a sharp bend forward of the anterior parietal, and another from the marginal gyrus of the fissure of Sylvius. They are both small, narrow, and atrophied. There is also an atrophied communicating ridge going forward from the junction of these. On this junction is situated a pea-like nodule of cerebral matter. The rest of the gyrus is 1 in. long, $\frac{1}{8}$ in. broad, and high; slants forward as an irregular cord along the floor of the smooth, deep chasm, which separates the marginal convolutions of the great mesial and Sylvian fissures.

The convolution is completely atrophied with the exception of the nodule described; hard, rough, and of a reddish colour.

LEFT SIDE.

The commencement and termination is superficial, and its middle portion concealed and sunk. It leaves the fore border of the anterior parietal by a double root; the lower, superficial $\frac{1}{4}$ in. broad; the upper, deep and narrower. There is a deep sulculus between them. There is another sulculus above, and in front of this, on the gyrus. Immediately in front of this the gyrus disappears and becomes completely atrophied. It is $\frac{1}{8}$ in. high, and $\frac{1}{10}$ in. broad and continues in this condition for $\frac{3}{8}$ in. From the termination of this portion it sends forwards a sunk ridge of the same character, $\frac{1}{2}$ in. long, which communicates with the gyrus in front of it. The remaining portion gradually rises into view, is $\frac{1}{8}$ in. broad, $\frac{7}{8}$ in. long, and is inserted into the great marginal convolution. Superior to it there is a broad deep smooth sulcus, and inferiorly the sulcus is more irregular and crossed by the gyrulus described.

2. *Second Ascending Frontal.* (2, Figs. 1 and 2.)

RIGHT SIDE.

This atrophied ridge rises from the marginal convolution

LEFT SIDE.

This convolution is about $1\frac{1}{2}$ in. long, and parallel to the last,

of the fissure of Sylvius, and proceeds as a narrow, nodulated, diminishing cord, parallel to and beneath the trunk of that gyrus; after giving off a short ridge of communication to the gyrulus in front of it, it ascends perpendicularly, and crosses the chasm which separates the great marginal convolution from the marginal convolution of the Sylvian fissure. This portion of it is $\frac{1}{4}$ in. long, $\frac{1}{8}$ broad and high. At its insertion it becomes again thicker. It contains very little proper cerebral matter, being hard, shrivelled, and contracted. communicating with it by the atrophied ridge described, and with that in front by another, $\frac{1}{2}$ in. long and $\frac{1}{4}$ in. broad. It is very narrow at its commencement, about $\frac{1}{8}$ in., and continues so for $\frac{1}{4}$ in., at which point it is most completely atrophied, and is joined here by the communication from behind. It then becomes broader ($\frac{1}{4}$ in.), and goes to be inserted in the great marginal convolution, giving off, at the commencement of its broad part, a small ridge of communication with the gyrulus anterior to it. It has sulci on each side of equal depth, and crossed by the ridges noted.

3. *Third Ascending Frontal.* (1, Figs. 1 and 2.)

RIGHT SIDE.

This gyrus is very similar to that of the other side, and is as complex. It has two roots of origin, one superior, superficial, and broad, and one inferior, sunk, and narrow, with a deep irregular sulculus between. It has a narrow insertion into the great marginal convolution. The body is broad, irregular, and dimpled. It has a third root and origin which also receives the communicating ridge from behind.

LEFT SIDE.

This gyrus is triangular in form, springs by a broad two-legged base from the gyrus of the Sylvian fissure. It is inserted by a point into the great marginal. Its direction is almost horizontal. There is a deep sulculus between the legs, and another in front of that. The upper leg of origin is sunk, narrower than the lower, and is joined by the communicating ridge from behind. Above is a deep sulcus, with columnated sides and broad floor. Below it is a sulcus separating it from the commencement of the great marginal gyrus, and not so broad.

VI. The internal aspect of the *Fronto-Parietal Lobes* (Figs. 3 and 4) presents no abnormality, except the great shrinking and atrophy of the quadrilateral lobe on the right side (1′, Figs. 3 and 4). The disparity in size is very striking. The other convolutions, marginal (2), and that of the corpus callosum (1), are bulky and symmetrical.

The foregoing description exhausts the geography and indicates the peculiarities of the convolutions. The more normal and better

developed have been described generally, and the atrophied more minutely.

RESUMÉ.

I. *Convolutions unatrophied.*
1. Central lobe of each hemisphere.
2. Temporal convolutions of each hemisphere.
3. Three occipital of left side, and two lower occipital of right hemisphere.
4. Ascending parietal convolutions.
5. Convolutions of corpus callosum.
6. Marginal convolution of left hemisphere.
7. Quadrilateral and internal occipital lobules of left hemisphere.
8. Lobule of marginal convolution of fissure of Sylvius, and pli courbè of both, and lobule of second ascending of left.
9. Orbital lobule, and lower frontal stage of each.

II. *Convolutions partially atrophied.*
1. Superior occipital of right hemisphere.
2. Quadrilateral lobule of right.
3. Inferior *pli de passage* of right.
4. Lobule of second ascending of right.
5. Marginal convolution of mesial fissure of right.
6. Middle of right and superior frontal convolutions of left.

III. *Convolutions completely atrophied.*
1. Three annectent convolutions of right.
2. Middle and part of superior frontal stage of right.

COMMENTARY.—The function of a commentary upon a case being to state in general terms the facts more minutely detailed in the text, and to bring these thus generalized into relation with general principles or other cases, I shall content myself mainly with the former of these processes, pursuing the division followed in the detail of the case as the most simple and natural.

1. As to the etiology—hereditary predisposition, as far as evidence exists, may be eliminated, except that on the assumption of its absence, convulsive derangement (mania of musculo-motor centres) affected such a large majority, 7 to 2, of the issue of the (cerebrally) healthy pair. The cause "assigned" and occupying the greatest prominence in the history, is a purely physical one. Up to the period of attack by the typhus fever, the subject was developing, physically and psychologically, satisfactorily. Then occurred an event causing defective nutrition of the brain, from contaminated and deficient supply and excessive waste of substance with little or no repair. There may have been, coupled with this, a presumed tendency to imperfect development of the nerve centres. At any rate, at this point of the life history (thirteenth year), the development of the brain was arrested, and a process of degeneration and atrophy set in with the effects displayed in the detail. It is

also remarkable that this occurred before or during the period of the third dentition; that, in fact, the perfecting of organization and action which that process expresses was obtained neither as to body which was infirm, and to a certain extent deformed, organs which were small and degenerated,—brain which was small, simple, and imperfect—nor the teeth themselves, which were abnormally small or wanting.

2. As to the condition of the patient at the thirty-second year, and his subsequent history, his physical organization was fair, and functional condition in moderately good state. He was small, awkwardly built, slovenly in motion, but of arthritic diathesis, and in possession of good general health. His cranial development was meagre as to the capacity of the cavity, strong as to the features of the osseous walls. The testes were ill developed. The body generally exhibited no asymmetry; but the awkward misshapen ears were unequal; the left (that on the same side with the sounder hemisphere) being larger. The "wisdom teeth" of the upper jaw were imperfect, that on the right side (the side of the worse hemisphere and smaller testicle) being wanting; and while the teeth of the upper jaw, as is usual, were most decayed, there was a greater amount of caries and destruction on the left side, the side opposite to the more atrophied brain. The psychological condition of the patient was one of pure and profound dementia; that variety of dementia whose substantial cause is deficient substratum. The impairment of every faculty except the most degraded in the scale was great, but his state can bear comparison with no animal lower in the scale. He was superior to all in the fragmentary capacities of impression, expression, and adaptation which he had, which, even in their broken and impaired state, had a greater likeness to the human than any other being; but he was inferior to all, inasmuch as he was unable to provide for the continuance of his own life and comfort, and must have starved, and lived in nakedness and filth, if others did not supply his wants and minister to him. He had too little nerve substance for an adult human being, but too much for any other animal. He exhibited as a mode of life the phenomena which are produced in animals when portions of their brains are removed, considering their respective characters and conditions of life. The case is singularly satisfactory, in that the pathological conditions are capable of fully and easily explaining the psychological peculiarities. The epilepsy also, which was such a prominent feature in the history, has also a rational explanation. It was a pure example of what I believe to be more common than is generally allowed,—namely, cerebral epilepsy. There was no disease of cerebellum, medulla oblongata, pons, or ganglia, sufficient to account for it,—it alternated with cerebral symptoms, vertigo, and loss of consciousness, and was unilateral, the convulsions occurring on the side opposite to the larger mass of nervous matter. The other side was semi-paralyzed. What aroused the (compara-

tively) excessive hemisphere into excessive action cannot be easily explained otherwise than by stating that it was the mode or expression of life of the nerve centres constituted as they were. At the last the morbid action assumed a rhythm and repetition which seems to declare that a degree of inequality and disproportion was obtained which rendered tranquil or static existence impossible, and unilateral convulsions accordingly appeared with the regularity of the respiratory or circulatory action proceeding downwards from the muscles, whose centres are more related to the psychical centres to those more remote from these.

3. As to the morbid anatomy of the body, the autopsy revealed an advanced state of necrobiosis of several important organs, fatty degeneration of the liver, kidneys, and heart, and pigmentary degeneration of the lungs; a state of age of these organs out of proportion or correspondence with the age of the individual, a process of natural or vital decay occurring in the well developed and healthy far on in life, when tissues and organs are prone to assume organic forms low in type, or inorganic forms. In this ill-developed subject these changes were far advanced when structure and function should have been in greatest perfection. The mode of degeneration of the brain, which will receive special investigation, appears strongly to confirm the notion that throughout it contains connective tissue corpuscles, which, here, seem to be the only remaining constituent.

4. As to the brain itself, its small size and lightness are the most prominent facts. Next comes the inequality of the hemispheres, the atrophy, and the particular portions atrophied. These are minutely set forth in the detail. The most interesting fact of the case is, that those masses of central nerve substance which occur low on the nervous system, cerebellum, medulla oblongata, pons varolii, central ganglia, and basal convolutions, were as large and sound as the same portions of a healthy brain. The most elevated or abstracted; the centres of the most refined, remote, and complex cerebral processes were those involved in the maldevelopment and wasting. The symmetry of the convolutions was remarkable, but the symmetry of the morbid process still more so. The case also has an interesting bearing upon an eminent discussion as to the classificatory value of the brain which occupied the attention of scientific men last year.

Dr George Rolleston, in an excellent lecture delivered at the Royal Institution, summarizing the affinities and differences between the brain of man and the brains of certain animals (*Med. Times and Gazette*, 15th March and 22d February 1862), says: "The doubly, and more than doubly greater weight, the doubly greater corpus callosum, the first and second *pli de passage* (the bridging convolutions), and those complexly convoluted frontal lobes, are, I believe, the four points in which the human brain asserts its superiority over that of the ape."

In this case, the cranial capacity and weight are greatly deficient —the so-called bridging convolutions atrophied and sunk, and the frontal convolutions still more so. The degree of overlapping of the cerebral lobes over the cerebellum is exhibited by the casts, which show a great shortcoming in this respect; and it was found that the posterior horn of the lateral fissure and the notable hippocampus minor were both considerable features.

FIG. 1. EXTERNAL SURFACE OF LEFT HEMISPHERE—EXACT SIZE.

References after Gratiolet.

S, S, S. Fissure of Sylvius.
R, R, R. Fissure of Rolando.
P, P. External perpendicular fissure.
1. Inferior frontal stage.
1′. Orbital lobule.
2. Middle frontal stage, partially atrophied.
3. Superior frontal stage.
3′. External aspect of marginal convolution.
4. First ascending convolution.
5. Second ascending convolution.
5′. Lobule of the second ascending convolution.
6. Curved convolution—pli courbe.
7. Inferior marginal or superior temporal convolution.
8. Middle temporal convolution.
9. Inferior temporal convolution.
10, 11, 12. Superior middle and inferior occipital convolutions.
A, A, A. Lobule of the superior marginal convolution.
B, B′. Small annectent or bridging convolutions connecting 5 with A and 6.
α. First bridging convolution—pli de passage.
β. Second do. do.
γ. Third do. do.
δ. Fourth do. do.

FIG. 2. EXTERNAL SURFACE OF RIGHT HEMISPHERE—EXACT SIZE.

References as for Fig. 1.

Almost complete atrophy of middle and superior frontal stages, and superior bridging convolutions displayed.

FIG. 3. INTERNAL SURFACE OF LEFT HEMISPHERE.

F, F, F. Fissure of fronto-parietal lobe.
I, I. Internal perpendicular fissure.
H, H. Fissure of the hippocampi.
1. Convolution of the corpus callosum—gyrus fornicatus.
2. Marginal convolution.
1′. Quadrilateral lobule.
3. Internal occipital lobule.
4. Inferior internal pli de passage.
5. Superior internal temporal convolution.
6. Middle internal temporal convolution.
9. Inferior temporal.
10, 11, 12. Occipital convolutions.

FIG. 4. INTERNAL SURFACE OF RIGHT HEMISPHERE.

References as for Fig. 3.

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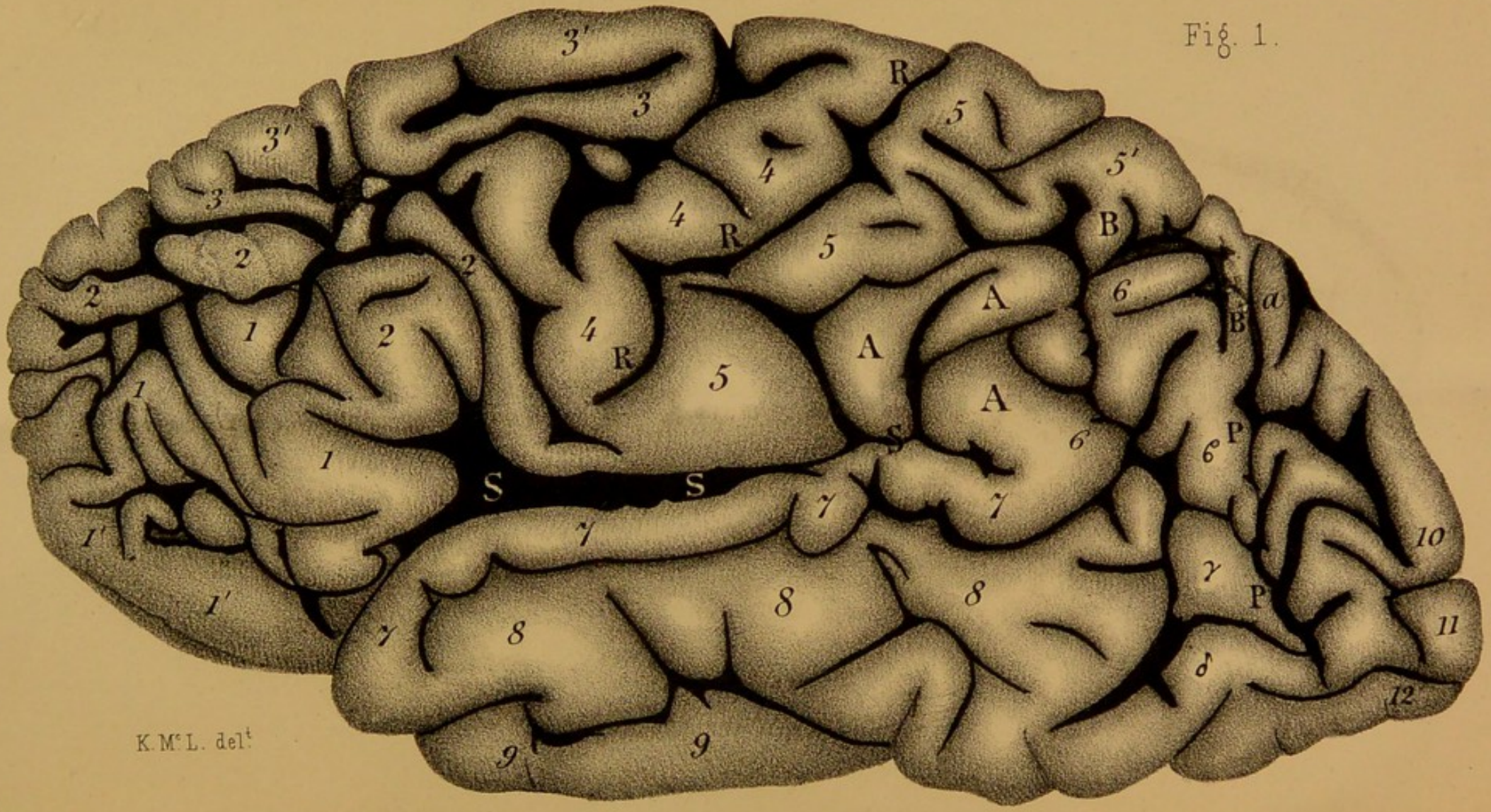
ATROPHY OF THE BRAIN.

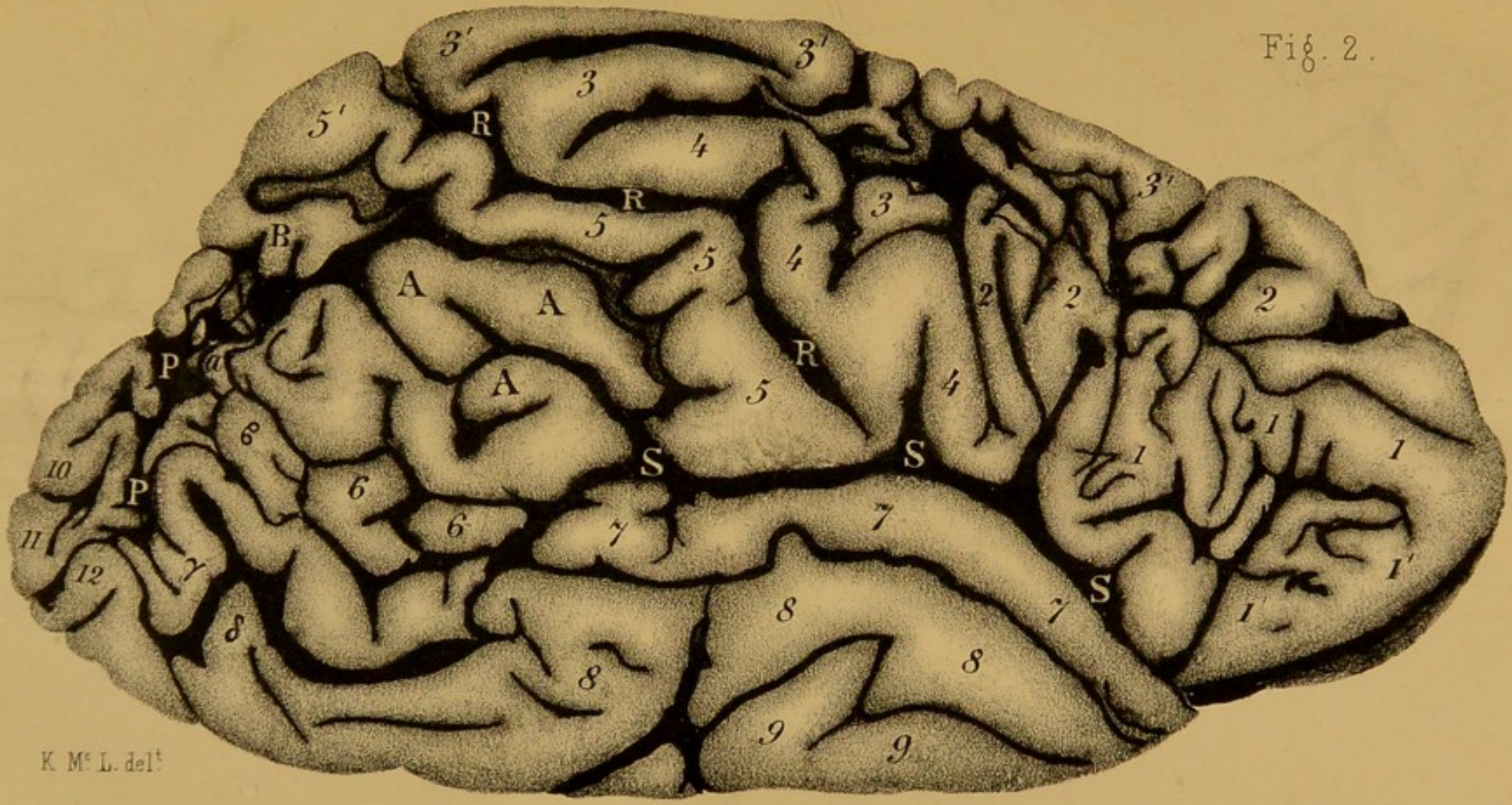
Fig. 1.



Left Hemisphere. (External Aspect.)

ATROPHY OF THE BRAIN.

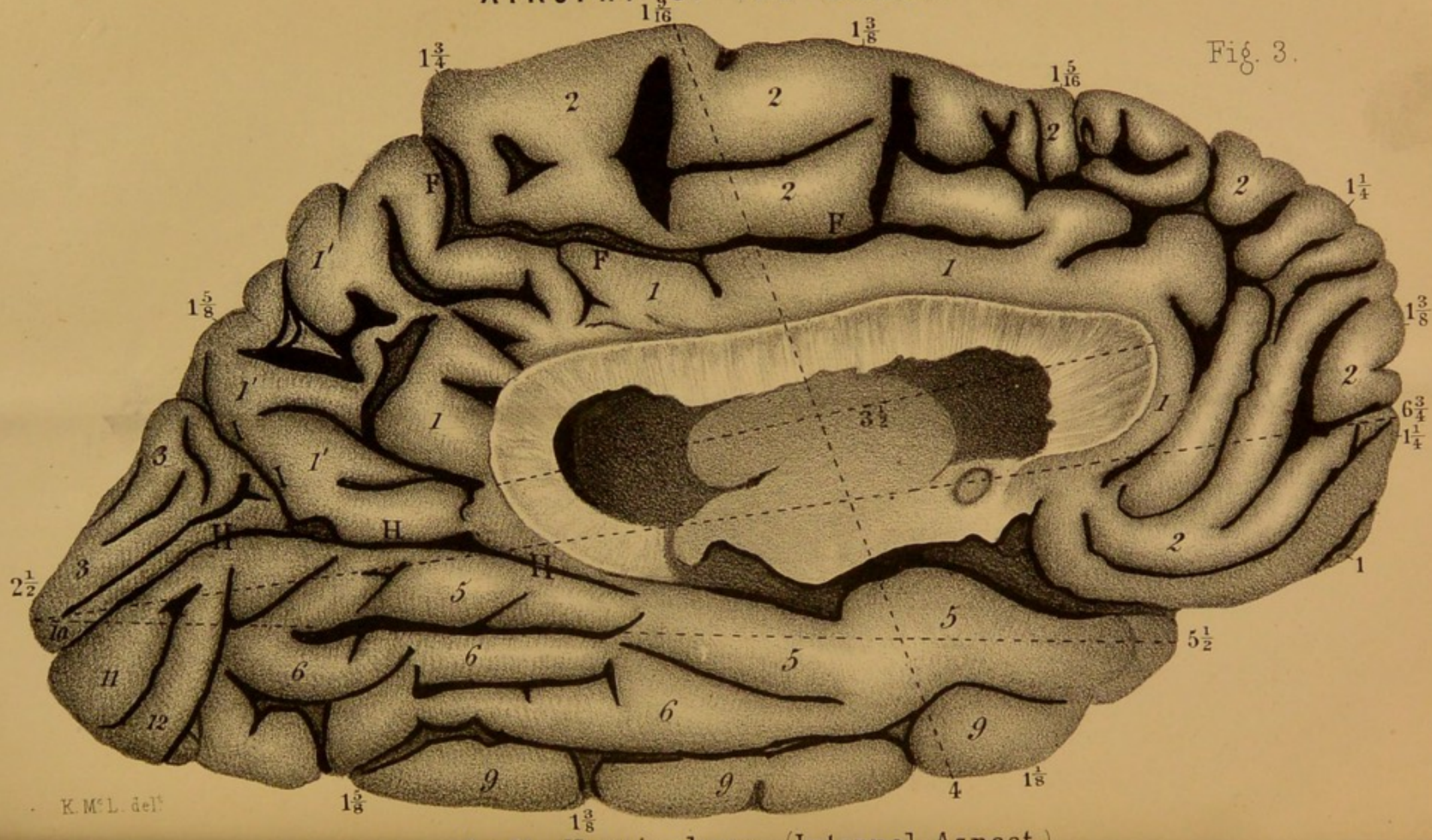
Fig. 2.



Right Hemisphere. (External Aspect.)

ATROPHY OF THE BRAIN.

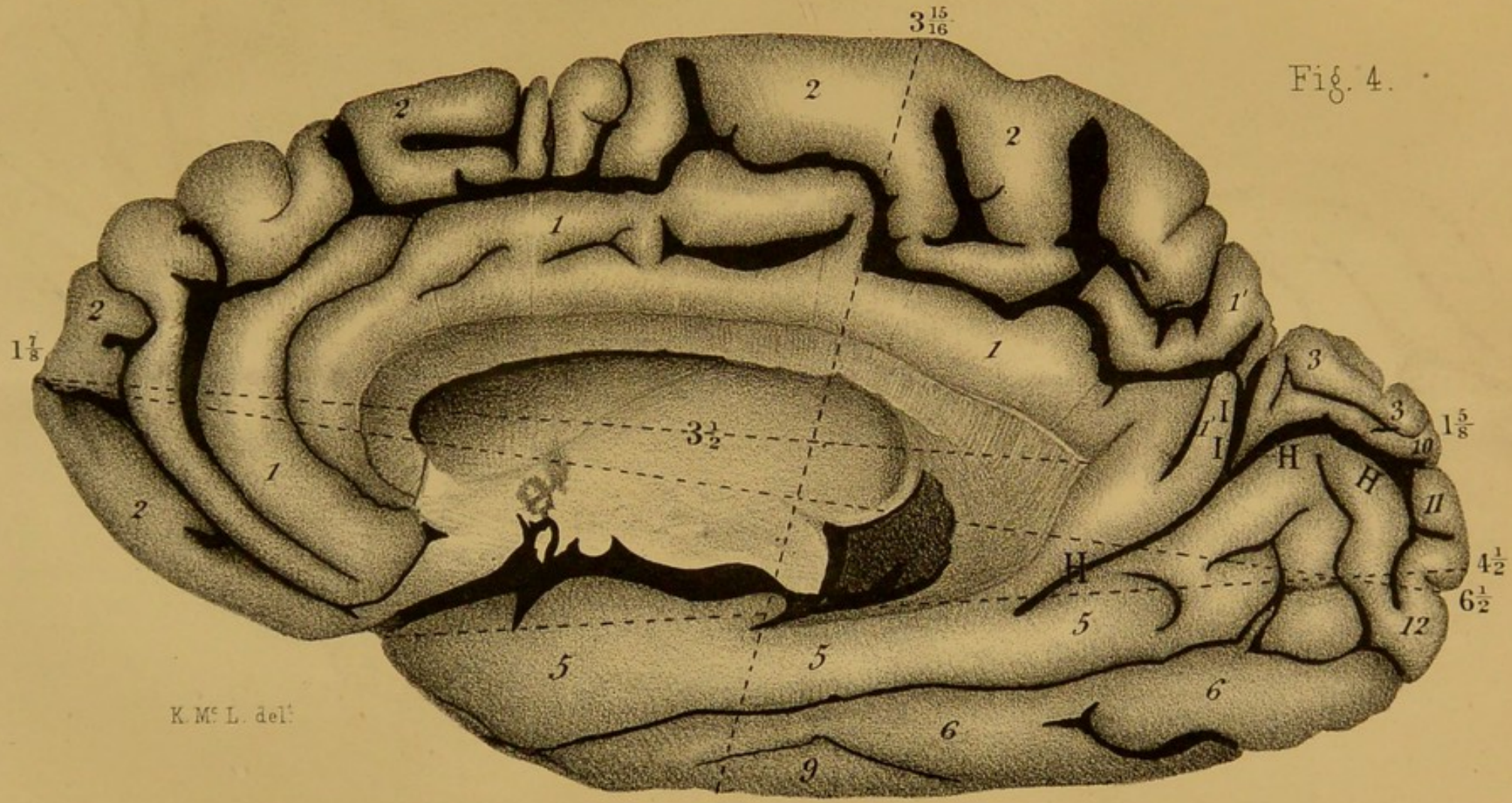
Fig. 3.



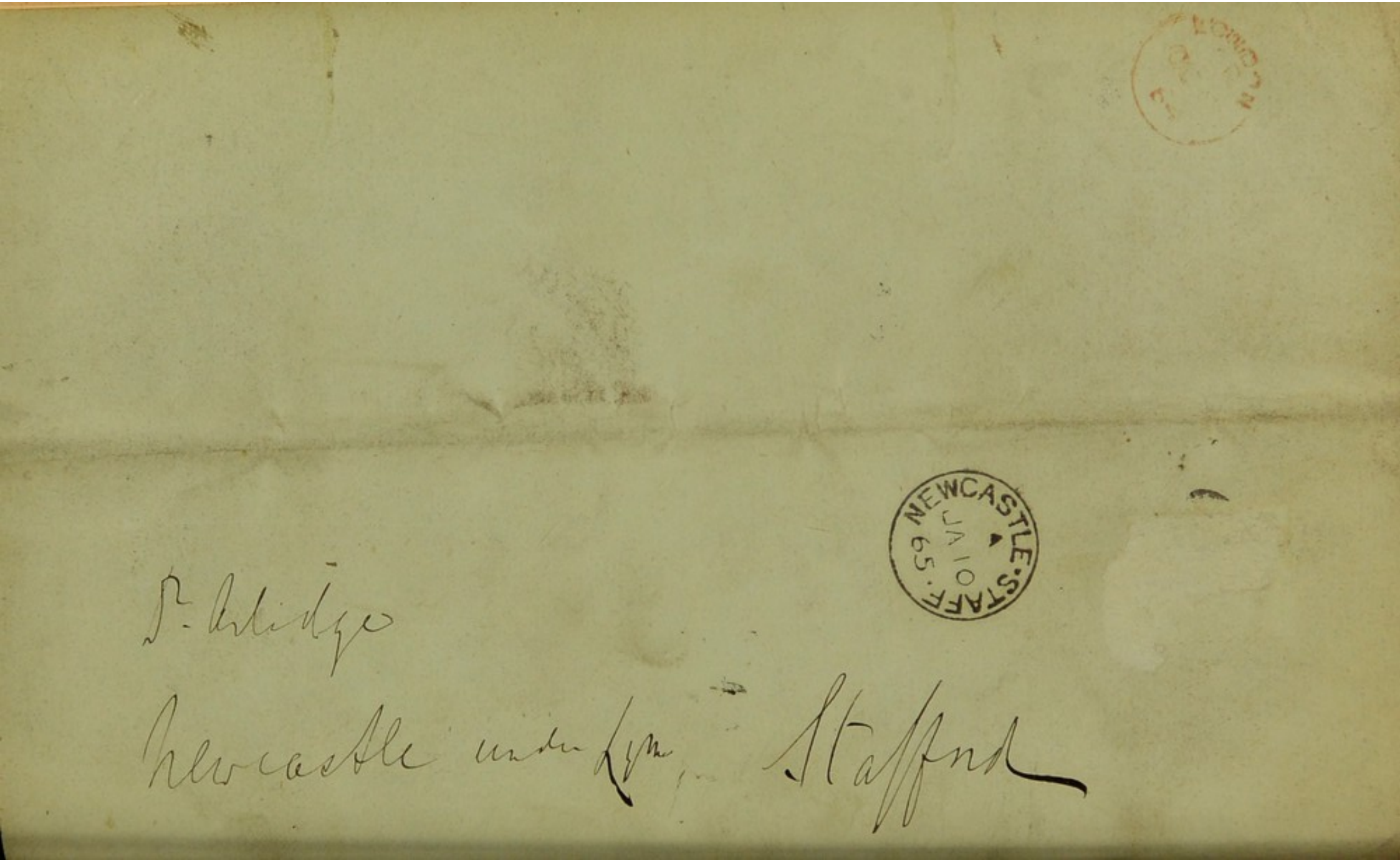
Left Hemisphere. (Internal Aspect.)

ATROPHY OF THE BRAIN.

Fig. 4.



Right Hemisphere. (Internal Aspect.)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