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James Henry Pullen, the Genius of Earlswood.(1)

By F. SANO, M.D.

"What could he think himself to be? 'Wuotan?' All men answered, 'Wuotan!'"—CARLYLE.

IN old times, when kings occasionally wanted to know the real opinion of their people, they asked their fool, and it has become a proverb that "fools tell the truth while laughing." But the court jester is not always an agreeable man, and it is also said that before he teaches you the maxim he "will annoy and pester." Thus we may suppose that these were of different kinds.

There is often a peculiar interest in the talk of the simple, as they see things from a realistic point of view, without any sort of that personal control which the complexity of influencing by reason develops: "Qui respiciunt ad pauca, de facili pronunciant." Some dwarfs have been famous not less by their degenerated conditions than by their uncommon and astonishing influence in court, due to their readiness to talk freely. They kept the attention of the most powerful rulers, and their fame was so great, that we still find in the museums portraits of them painted by the greatest masters, *e.g.*, Velasquez and Rubens.

A feature of their character, which seems always to have been a key to success, was their obstinacy. Nothing could disturb them from their fixed ideas, and when in a bad mood, no favour of their wealthy protectors could induce them to change their attitude.

Where kindness, politeness, obligingness and mutual confidence make social life agreeable, no open criticism nor "brutal frankness" can have its place, no perseverance can attain its final desire, unless very exceptional superiority prevails, which is not to be found in a microcephalic or in a hydrocephalic brain.

Such are some of the first thoughts which readily occur to the mind, when the object of this study is announced to be: *The Genius of the*

Royal Earlswood Institution for Feeble-minded at Redhill. But they can only in part be applied to the case.

It was not a synthetic wisdom nor shrewd remarks that could have made James Henry Pullen the subject of such world-wide interest, and attracted to him the favour of the late King of England's gracious attention; for Pullen was living in his egocentric preoccupations, and he hardly uttered more than a few words on his own behalf, as "very clever!" and "wonderful!" But these few words were said with such complete a confidence and so suggestive a power, that everybody who approached him repeated them with the same conviction. Thus "very clever" he was indeed, let me also say it, and "wonderful" his psychological success.

Having been impressed, as every child of five or six, by the small ships which his playmates tried to manœuvre on narrow puddles along the roads of Dalston, his birthplace, he got the obsession of making by himself such toys, and he soon became skilled in carving ships and in reproducing them in pencil drawings. Until the age of fourteen he attended school, but always irregularly. Owing to his deafness and dumbness, he was left isolated, and henceforth followed his own mental way, growing original, egotistic, such as he remained for his whole long life, with an undoubtedly childish character.

Until he was seven years old he could only say "muvver," apparently for *mother*. He afterwards learned from his parents, brothers, and sisters some monosyllabic words concerning the products of his beloved occupations, and he later on knew just enough to write in a jealously-kept memorandum book the summary of the work he had accomplished, the number of the pieces used, and the estimated amount of pounds sterling he hoped to obtain by selling his so-called model-ships. Thus his vocabulary was very poor, and although he was considered by those who observed him for years as nearly normal in all his sensorial organs, with the exception of his ears, he never learned to read nor to write. He was sensitive to vibrations coming from the ground, and had arranged an alarm system in his workshop, based upon that sensibility, which made him aware of a coming visitor. His dumbness was commensurate with his deafness; he was unable to give any intelligible answer, unless he could accompany his broken words by gestures, and the few formulæ expressing his admiration for his own personality were acquired in his youth, and remained unchanged.

In his own diagrammatic history, a large drawing with forty scenes of his life, Pullen shows how he was resistive to school teaching in 1851. After the usual school hours the master tries to give him private lessons; but the boy weeps, and puts his head in his arms on the table, making any attempt to cheer him up ineffective. Two years later, with a smiling self-contented expression, he pays a visit to his old master, and gratifies

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him with the presentation of a small model-ship, which the master will be proud to place on the mantelpiece! If Pullen had been simply affected by sense deprivation, would this have been the course of events? Did not Pullen show himself the strongest in the conflict of his individuality with the stereotyped pedagogy of his surroundings? Think of Helen Keller, deprived of sight and hearing, and yet able to acquire every kind of knowledge that ennobles human understanding. But Pullen! with both his eyes wide open to the bright world of London, and his skilled ten fingers under complete sense control, Pullen, even after having been busy for months in the printer's shop at Earlswood, could not absorb, digest, or exteriorise the most ordinary sentence of politeness. To say, "I am very much obliged to you, Sir," was strange to him in grammatical arrangement as well as in social meaning.

His admission into the Earlswood Institute at the age of fifteen gave him the opportunity of using better tools and of learning much in the carpenter's shop. It helped him in the performance of his model-work; it allowed him to use better material, to carve ivory, and to bring to childish perfection the mechanical details of his constructions. Earlswood, however, with its most excellent organisation and its experienced medical and pedagogical staff, could not make of him anything but an interesting case of psychiatry, a wandering curiosity in Surrey, an exceptional advertisement for the institution.

"He was obviously too childish," writes A. F. Tredgold, (2) in the extensive and interesting chapter he devotes to him in his valuable book on *Mental Deficiency*, "and at the same time too emotional, unstable, and lacking in mental balance to make any headway, or even to hold his own, in the outside world. Without someone to stage-manage him, his remarkable gifts would never suffice to supply him with the necessities of life, or, even if they did, he would speedily succumb to his utter want of ordinary prudence and foresight, and his defect of common sense" (p. 312).

But as to his tenacity in keeping his own directing idea through seventy-five years of conscious mental activity, it was as remarkable as successful. His originality was the result of his patience and perseverance. What made him famous was the realisation of a childish programme, remaining all through in its limited frame as originally conceived, but progressively renewed and completed with all the skill and the experience that memory and maturity of age could bring about.

He was allowed the privilege of a private workshop, and a special room in which his productions were exhibited. Both rooms are preserved and on view at the institution; they are worthy of the greatest attention, as they are an exceptional and typical exteriorisation of the mental and manual activity of such kind of men as Pullen was.

At the age of twenty-six he made his first representation of the

Universe, which he probably had long pondered over. It is a large barge, half as wide as it is long. There is a well-furnished room in the centre. White ivory angels are outside at the prow, and Satan (or Neptunus?) is at the stern. A centre-rod acts on twelve oars and forked lightning strikes the top of the construction. Thus there is partly traditional influence and partly genuine conception, the whole being a fine illustration as to how men are inclined to accumulate in one general synthesis their knowledge of the world, as they have perceived and conceived it. For Pullen the world could only be a ship. Mankind in its first principles believe alike, our hero yielded to egocentric, homocentric, and geocentric conceptions.

He was thirty-five years when he began his masterpiece, "The Great Eastern," a complicated model-ship, every piece of which was made by himself with the greatest patience. It took him more than seven years to complete it, and it was exhibited at the Fisheries Exhibition, where it obtained the medal, not as the most perfect production of its kind, but because every screw and every pulley had been made by the exhibitioner himself. Thus the prize was won by the patience he had shown, but next to this patience was the inability to take advantage of others' skill and help. A normal individual would have obtained better results by co-operation and division of work. Pullen reached the goal by his best qualities, as well as by his worst defaults, but both were extreme, and they made him so exceptional that he was unanimously declared "superior."

He thought it possible to impress and frighten people by a giant mannequin, which he had erected in the middle of his workshop. Sitting inside this monster he could direct the movements of its arms and legs, and make a great noise through a concealed bugle fitted to the mouth of the giant. In this contrivance the attempt to cover personal weakness by frightfulness was already apparent, but his suspicious tendencies became evidently pathological and dangerous when he established a man-trap to kill every undesirable visitor who might try to enter his private workshop during his absence.

Besides his ships, he made book-cases, tables, and some small model-houses. During the time he had to remain in bed with a broken leg he made a number of good drawings, and he often began the same copy again with the same patience and accuracy, just as he made many of the same models of ships, without ever showing any sign of mental fatigue or lack of attention. He also executed a number of ivory carvings, and made brooches, dress-pins, and walking-sticks.

"His Majesty King Edward, when Prince of Wales, took great interest in him," writes Dr. Caldecott, Medical Superintendent of Earlswood, "and graciously sent him tusks of ivory to encourage him in producing his beautiful carvings. He was proud to show these

J. H. Pullen

FIG. 1.—J. H. PULLEN, IN HIS BEST TIME, WEARING ADMIRAL'S UNIFORM.

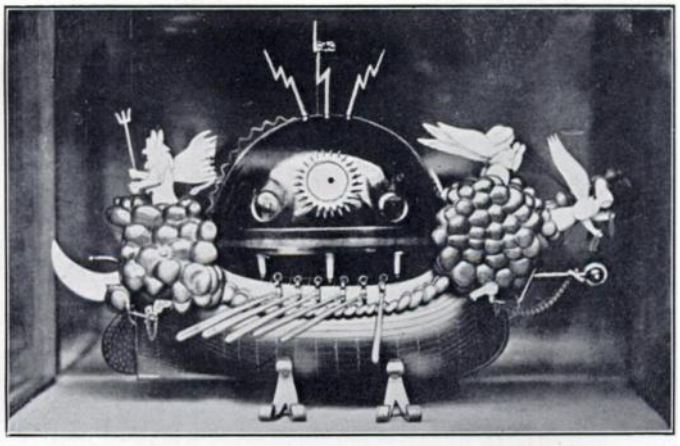

FIG. 2.—THE MYSTIC REPRESENTATION OF THE WORLD AS A SHIP, BY J. H. PULLEN.

To illustrate paper by Dr. F. SANO.

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gifts, and, although imperfect speech limited his expression to 'Present, friend Wales,' it was evident he was conscious of the condescension of his august patron."

I have twice visited and carefully examined the workshop and the exhibition-room of Pullen, and I feel very much indebted to Dr. Caldecott and to Dr. Stephens for most of the information which I here recall in addition to what Dr. Tredgold has already published. The following note, which Dr. Stephens wrote on September 15th, 1913, may describe the decline of Pullen's glorious career:

"A very interesting case. He took me round his workshop to-day, and I spent three hours there, being shown besides his 'Giant,' and the excellent models of boats, kites, etc., his journal, carvings in wood and ivory, and the many intricate but thoroughly ineffectual 'man-traps' he had made to guard his treasures. He had the artist's pride and vanity in his works, coloured by a great childishness and simple faith in his unfailing capacity and genius. For he does not seem to realise that he is weekly growing more feeble, that he has lost his curious powers of inventiveness and design, and that now he needs must spend his days in the making of rough carvings in bone and ivory, infinitely inferior to the worst of his earlier work. He has the artist's sense of jealousy, for he would not let me touch or examine anything. I only may gaze from a respectful distance! and he told me confidently that just before he dies he intends to wreck and destroy everything that he has made."

It may be of interest to know what the people, living outside the asylum, thought of Pullen, who was allowed much freedom. I therefore interviewed some who knew him, and I had the following description from one, who being born and having resided for a long time at Redhill saw Pullen quite regularly about twenty-five and even thirty years ago:

"Everyone in the neighbourhood knew Pullen very well; he liked to sell ivory pins and brooches for a shilling or so, although he never approached anybody with that purpose. He was proud, and often remarked that he belonged to a royal family. One spoke always to him in a simple manner as to a child, and more with signs than with words. His talk was broken and difficult to understand. He had a curious shape of head and usually wore a Scotch cap. He knew the value of money, and returned exactly the change for small amounts." He sometimes went for holidays on his own, and our informant, Mr. Hollmwood, remembers having seen him at Brighton as a self-respecting boarder.

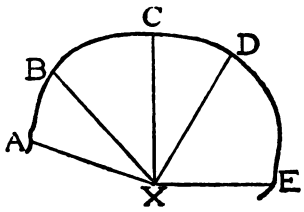
From Pullen's sister we know that the parents were first cousins; thirteen children were born in the family, six of whom died in infancy. A brother was deaf and dumb, and was a fine drawer. He became maniacal, and died at Earlswood from cancer at the age of 35.

Pullen deceased May 31st, 1916. The *post-mortem* examination performed by Dr. Stephens on June 1st, revealed senile decay and a little pneumonia. The left testis was small, shrivelled, and fibrous; the right healthy. The condition of the left testicle was caused by a fall while at work, about fifteen years before death.

The brain was put in a 10 *per cent.* formalin solution, and later on forwarded by kind permission of Dr. Caldecott to the laboratory of the Maudsley Hospital. Col. F. W. Mott handed me the brain for examination, and I am very grateful for this confidence, which I have tried to justify by furnishing an accurate description.

Measurements.—On admission, Pullen was 5 ft. 7¼ in.; his weight was 9 st. 11 lb. The circumference of his head, 21⅝ in.—when dead, the circumference was 22⅝ in.

Measurements of the Cranium (according to Tredgold).



		Tape.	Calipers.
XAX	=	12¾	—
XBX	=	13	—
XCX	=	11⅝	5·2
XDX	=	11½	—
XEX	=	9⅞	—
ABCDE	=	14	F. 4

Index of capacity 3382$\frac{7}{8}$ (Tredgold's method). Width of forehead 5⅛; callipers 3·9. Tragus to glabella 6¼; callipers 5. Tragus to external occiput 4¼; callipers 4·4.

The auditory organ.—The temporal bones were removed, and both showed the same macroscopical external conditions. The right bone was decalcified, together with the bone of a normal (S. P—) and with that of a deaf-mute individual (H. A-). For this comparative examination I have taken the papers of Brouwer and Quix as a guide; until now, however, only the macroscopical examination could be performed on sections through the decalcified bones. They enabled me to give the following information. (See Table on p. 257.)

The bones of Pullen's skull were rather thin. The deaf-mute, H. A—, had thickened bones, as often occurs in deaf-mutism; neither of them had malformations in the middle ear. Pullen's external meatus and his middle ear were well developed, and, notwithstanding his old age, the tympanum was transparent and in fair condition. In both Pullen's and the deaf-mute's cases the internal ear showed a good condition of osseous development, the cochlea was of average dimensions, but the internal meatus of H. A— was shallow. The auditory nerve of H. A— was atrophied and thin.

The origin of deaf-mutism is very variable, and each case needs to be

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examined for itself. In the case of H. A— the eighth nerve was atrophied, and the notes mentioned that the patient had had three fits (or convulsions?) at the age of one year. The brain was of normal weight (1360), but adolescent insanity developed at the age of 17. The patient remained demented, and died from recently acquired tuberculosis at the age of 38.

Measurements.	Normal, S. P—.	Pullen.	Deaf-mute, H. A—.	Quain's anatomy.
Age	67	81	38	—
Height	5 ft. 10 in.	5 ft. 7½ in.	5 ft. 6 in.	—
Thickness of the temporal bone at the junction of the squamous and petrous portions	mm. 4·0	mm. 4·0	mm. 9·0	mm. —
Opening of external auditory meatus at the osseous portion:				
Greatest diameter	9·0	10·0	8·0	8·67
Smallest diameter	8·0	6·0	5·5	6·07
Opening of meatus internus	3·0	3·0	2·0	—
Greatest development of meatus internus:				
Greatest diameter	7·0	6·5	4·0	—
Smallest diameter	5·8	4·5	2·5	—
Surelevation of the superior semicircular canal on the surface of the petrous bone, above the s. petrosus superior	8·0	5·0	5·0	—
Base of the cochlea	8·5	8·0	8·0	8·0
Height of the cochlea	5·5	5·0	5·0	5·0

In the case of Pullen no peripheral origin could be traced. There was evidence of a lack of cerebral development, as will be shown later on. A brother of Pullen was a deaf-mute; the parents were first cousins. The deaf-mutism of Pullen appears to have had a cortical origin.

General Examination of the Brain.

Upon opening the skull the membranes were not found adherent, and there was no excess of cerebro-spinal fluid. The brain was put in 10 *per cent.* formalin solution.

The brain is small, but the general appearance presented is that of a satisfactory convolutional pattern. There is marked arteriosclerosis and enlargement of the ventricles, in the cavities of which the central nuclei project.

The brain weights (November 14th, 1916), after 5½ months' hardening in formalin solution, were:

	Grammes.
Left hemisphere	520
Right hemisphere	525
Rhombencephalon	145 × 8 = 1160
Total	1190

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The figures are probably a little higher than the original figures, as is the case during the first months of hardening in formalin solution. (Later on (August 4th, 1917) the weights of the hemispheres were 485, 475.) The negligible difference between right and left hemispheres and the figure obtained by multiplying the weight of the rhombencephalon by 8 show that the cerebellum had been arrested in its development in accordance with the lack of development of the hemispheres.

The brain had not been suspended in the fluid during the first period of hardening, and had been lying on its inferior surface, both hemispheres inclining towards the right side; exact measurements, therefore, could not be taken. The following results are given with this reservation, which especially applies to the questions marked with the asterisk (*).

TABLE A.—*Measurements according to the System of Cunningham and Spitzka.*

	In cm. L.	In cm. R.	In *per cent.* L.	In *per cent.* R.
Tape Measurements.				
Maximum length of hemicerebrum	17·9	17·9	—	—
Maximum width of cerebrum(*)	13·8		—	—
Cerebral index	—		0·77	
Maximum horizontal circumference	51·9		—	—
Maximum outer width of hemicerebrum(*)	6·7	7·1	—	—
Maximum occipito-temporal length(*)	18·2	18·2	—	—
Maximum length of callosum, and *per cent.*	8·5		0·47	
Centro-temporal height (vertex to horizontal glass)(*)	8·2	9·8	—	—
Centro-olfactory height(*)	7·5	8·1	—	—
Supero-mesial border (Cunningham's method):				
From the cephalic point to the central sulcus (frontal index)	15·0	14·5	59·28	57·08
From the central sulcus to the occipital transverse (parietal index)	5·9	5·9	23·32	23·32
From the occipital transverse sulcus to the occipital pole (occipital index)	4·4	5·0	17·39	19·68
Projection Measurements.				
Lateral surface; from the cephalic point to:				
1. Tip of temporal lobe	4·4	4·4	24·58	24·58
2. Junction of sylvian and presylvian fissures	5·0	4·9	27·93	27·37
3. Ventral end of central sulcus	7·6	6·7	42·58	37·85
4. Junction of sylvian and episylvian fissures	11·3	9·5	63·12	53·07
5. Caudal point	17·9	17·9	1·00	1·00
Mesial surface; from the cephalic point to:				
6. Cephalic edge of callosum	3·2	3·2	17·87	17·87
7. Porta (foramen of Monro)	6·5	6·5	36·31	36·31
8. Dorsal end of central sulcus	11·0	10·2	61·50	56·98
9. Dorsal intersection of paracentral sulcus	11·8	11·0	65·92	61·50
10. Caudal edge of callosum	11·6	11·6	64·80	64·80
11. Occipito-calcarine junction	13·8	13·6	77·09	75·97
12. Dorsal intersection of occipital transverse sulcus	15·9	15·5	89·44	86·59

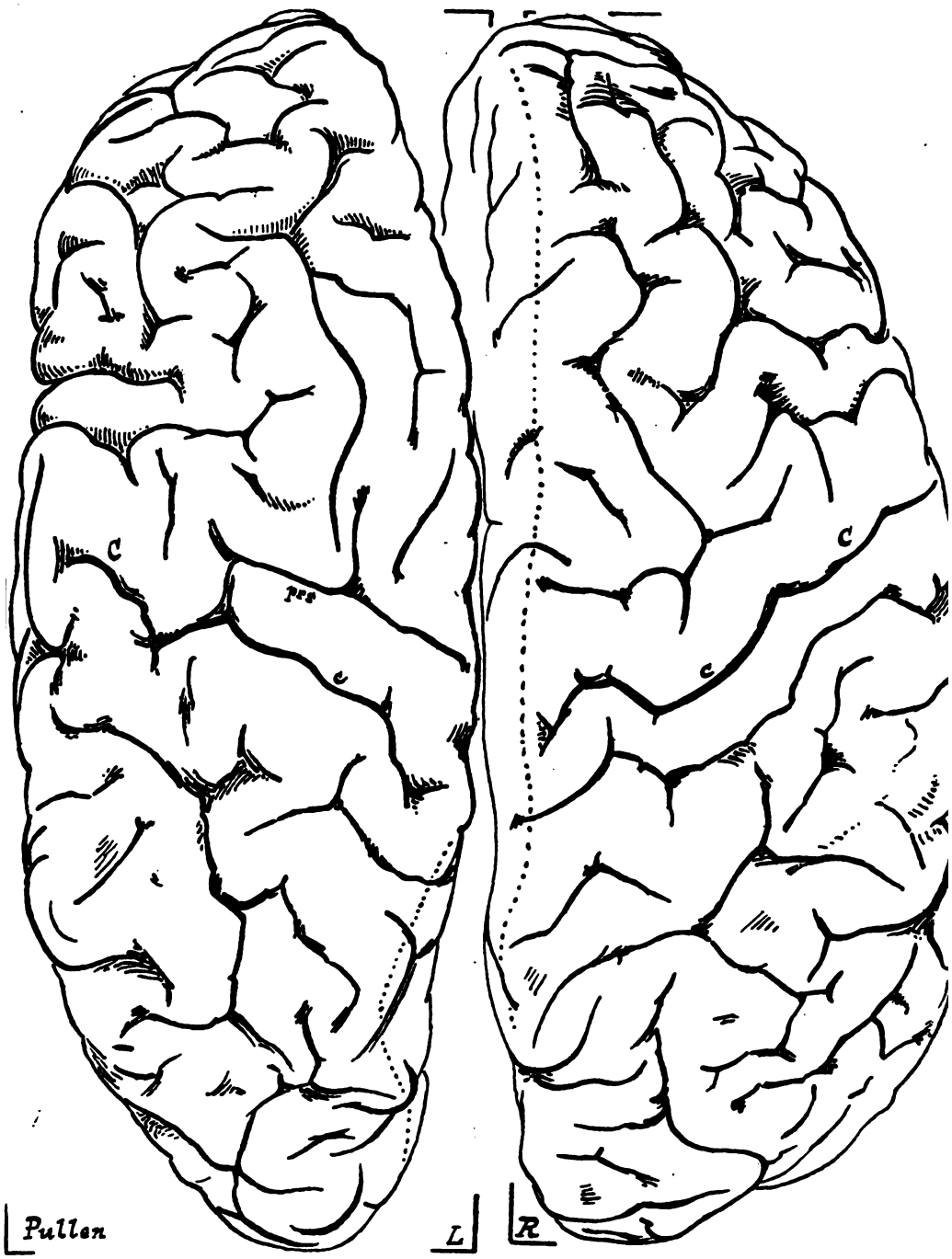

FIG. 3.—SUPERIOR ASPECT OF THE BRAIN, PROJECTION DRAWING (ORTHOGONAL).

Frontal pole up. Occipital pole down. *L.* Left hemisphere. *R.* Right hemisphere. *C.* Central sulc *prs.* Sulcus præcentralis superior. The dotted line indicates the supero-mesial border. On both sides t central sulcus remains independent from the lateral fissure (Sylvii), and it does not cut the supe mesial border. The central sulcus has no connections on the right side, it has a connection with the on the left side in the cortical projection centre of the right hand. The slight distortion shown by t hemispheres is artificial and occurred during hardening, the brain not having been suspended.

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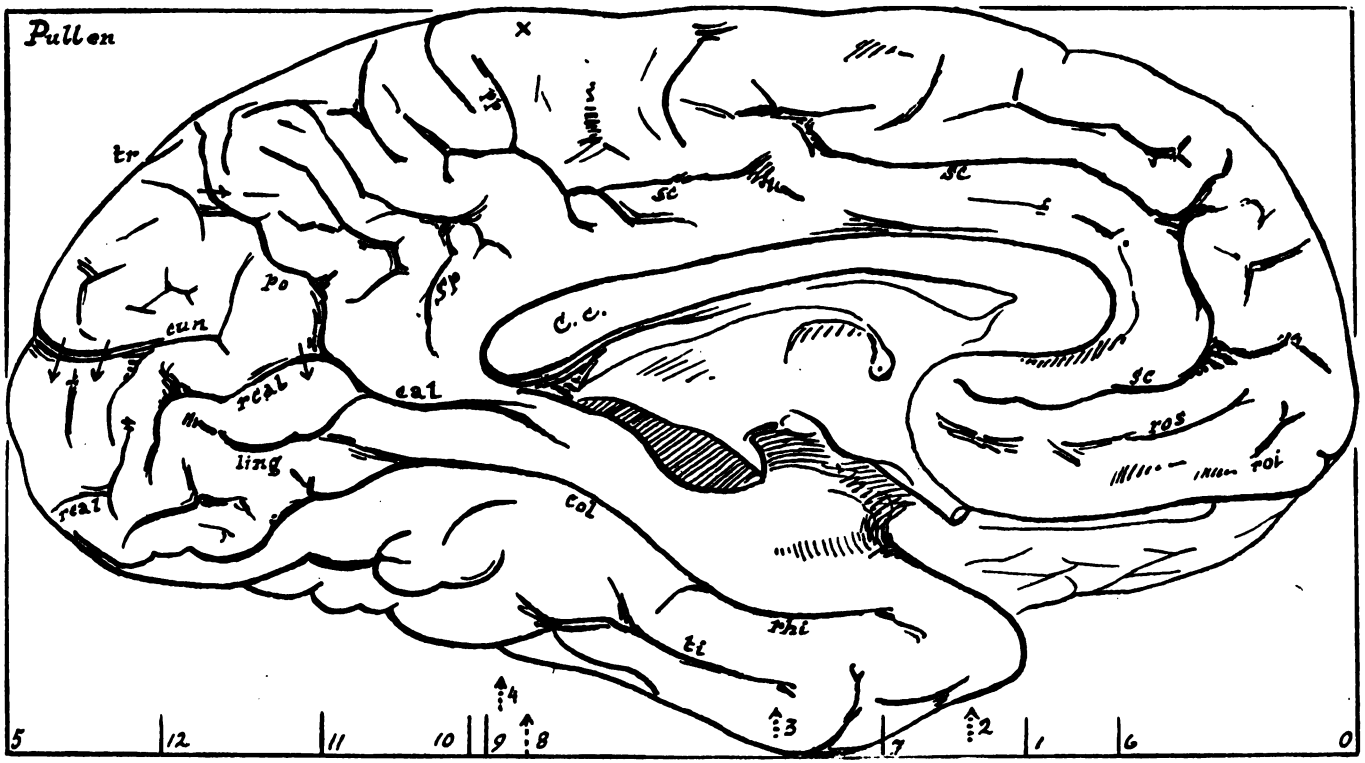

FIG. 4.—MESIAL ASPECT OF THE LEFT HEMISPHERE OF THE BRAIN. (*Natural size.*)

C.c. Corpus callosum. *sc.* Sulcus cinguli. *pp.* Post paracentral end of *sc.* *sp.* Sulcus subparietalis. *po.* Fissura occipito parietalis. *tr.* Sulcus occipitalis transversus. *cun.* Sulcus cunei. *cal.* Fissura calcarina. *rcal.* Interrupted fissura retrocalcarina. *ling.* Sulcus lingualis. *col.* Sulcus collateralis. *rhi.* Sulcus rhinicus externus. *ti.* Sulcus temporalis inferior. *ros.* Sulcus rostralis superior. *roi.* Sulcus rostralis inferior. *x.* Corresponding to the end of the central sulcus on the lateral surface. Arrows crossing the sulci (—→) indicate deep gyri. Arrows and numbers on the lower part of the figure refer to the numbers of Table A. Corpus callosum well developed. Parietal (præcuneus) and occipital regions complex.

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The Convolutional Pattern.

Fissura lateralis and sulcus centralis.—The posterior branch of the lateral fissure (*fl*) measures on the left side 6·2 cm., on the right side 4·6; *fl* has only one anterior ramus at the lateral surface on the left side, namely, the ascendant (*ra*), the horizontal ramus remaining at the concealed surface of the operculum orbitale. This operculum has no other indentations. The left posterior branch ends in a short ascending branch (*rpa*) and only an indication of the descending branch (*rpd*).

On the right side an independent sulcus, which does not join *fl*, represents the anterior horizontal branch of *fl* (rh); *ra* resembles the same sulcus of the left side. There are no other sulci on the opercula orbitale and frontale.

The central sulcus (*c*) reaches the superomesial border on both sides, but does not join it; *c* does not join the lateral fissure either, so that its end remains independent on both sides. At the left side *c* is joined by the superior precentral sulcus, but by no other sulcus, and at the right side *c* remains completely independent. On the left side *c* presents a well-indicated middle knee, but there is no superior knee. On the right side the superior knee is slightly indicated, but there is no middle knee. The right *c* has a more straight direction than the left *c*.

The sulci centrales are not deep; there are no concealed gyri; the usual buttress is of normal appearance.

Frontal lobes.—There is a good mesial sulcus (*fms*) on the right side; it is less developed on the left frontal line. The sulcus frontalis superior is more developed on the left side, but in neither does it join the superior precentral (*prs*) sulcus. The sulcus frontalis medius is better developed on the right side, and the sulcus frontalis inferior is interrupted on that side by three annectant gyri, which is not the case on the left side. The sulcus radiatus and the external piece of the sulcus fronto-marginalis have a common posterior ending on the right side; on the left side these two sulci are united in one sulcus of a very simple pattern. The frontal operculum is very simple. The convolutional pattern is certainly less complex on the left than on the right side. This is evident from a comparison of the mesial surfaces; the accessory sulci are regularly perpendicular to the sulcus cingulatus on the right side; they tend to be nearly parallel and not so deep on the left side.

The sulci orbitales are not similar on both sides, but it is difficult to say which side is the most developed.

Parietal lobes.—The sulcus postcentralis superior is separated from the sulcus postcentralis inferior in the left hemisphere, but these sulci join in the right; *poi* joins *fl* on the right, but not on the left side.

The sulcus interparietalis proprius (*ip*) is interrupted on both sides

nearly in the same manner, but the interruption exists more posteriorly on the left. The connections with the postcentral sulci present two rather unusual types, the frequency of which, according to Retzius, is respectively 11 *per cent.* (left) and 4 *per cent.* (right); 19 *per cent.* and ? *per cent.* (Cunningham); 7 *per cent.* and 17 *per cent.* (in my series of lunatic brains). The second part of *ip* extends far behind, and joins *oa* on the left.

In both supramarginal gyri there is a special sulcus, which joins *ft*; on the right side it joins also *poi.*

There is an independent portion of the superior parietal sulcus on the right side.

TABLE B.—*Particulars concerning Fissure and Sulci.*

			L.	R.
ft. and *c.*	1.	Fissura lateralis, number of anterior rami	+	+
	2.	Fissura lateralis, number of posterior rami	+	2
	3.	Sulcus centralis anastomosis with (+): s. præcentralis superior	+	—
	4.	Sulcus centralis anastomosis with (+): s. præcentralis inferior	—	—
	5.	Sulcus centralis anastomosis with (+): s. postcentralis superior	—	—
	6.	Sulcus centralis anastomosis with (+): s. postcentralis inferior	—	—
	7.	Sulcus centralis anastomosis with (+): s. subcentralis anterior	—	—
	8.	Sulcus centralis anastomosis with (+): s. subcentralis posterior	—	—
	9.	Sulcus centralis anastomosis with (+): fissura lateralis separately	—	—
	10.	S. centralis cuts superomesial border	—	—
Frontal lobe.	11.	S. præcentralis superior (+): s. præcentralis inferior	—	—
	12.	S. præcentralis superior (+): s. frontalis superior	+	+
	13.	S. præcentralis sup. divided into two sections	—	—
	14.	S. præcentralis intermedius present	—	—
	15.	S. præcentralis inf. anastomosis with (+): s. frontalis superior	—	—
	16.	S. præcentralis inf. anastomosis with (+): s. frontalis inferior.	+	—
	17.	S. præcentralis inf. anastomosis with (+): fissura lateralis	—	—
	18.	S. præcentralis inf. anastomosis with (+): s. subcentralis anterior	—	—
	19.	S. præcentralis inf. anastomosis with (+): s. diagonalis	—	—
	20.	Ramus horizontalis separate	+	—
	21.	Ramus horizontalis + s. frontalis medius	—	—
	22.	S. diagonalis well (+) or badly (—) developed	+	+
	23.	S. frontalis superior, number of segments	3	1
	24.	S. frontalis superior + s. frontalis medius	—	—
	25.	S. frontalis mesialis well developed (+)	—	+
	26.	S. frontalis medius well developed	+	+
	27.	S. frontalis medius, number of sections	2	1
	28.	S. frontalis inferior continuous	+	—
	29.	S. frontalis inferior + s. diagonalis	+	—
	30.	S. frontalis inferior + s. radiatus	—	—
	31.	S. frontalis inferior + s. fronto-marginalis	—	—
	32.	S. frontalis marginalis, number of sections	2	2
	33.	S. rostralis superior well developed	+	+
	34.	S. rostralis medius well developed	—	—
	35.	S. rostralis inferior well developed	—	—
	36.	S. rostralis transversus anterior joining *sc.* and border	—	—
	37.	S. orbitalis sagittalis + s. orbitalis transversus	+	+
	38.	S. orbitalis transversus, number of pieces	1	1
	39.	S. olfactorius well developed	+	+
	40.	S. olfactorius mesial (+) or lateral (—) direction	+	+

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TABLE B (*continued*).

			L.	R.
Parietal lobe.	41.	S. postcentralis superior (+) — s. postcentralis inferior	—	+
	42.	S. postcentralis superior (+) — s. interparietalis	—	—
	43.	S. postcentralis superior (+) — s. parietalis superior	—	—
	44.	S. postcentralis inferior (+) — s. interparietalis	+	—
	45.	S. postcentralis inferior (+) — s. subcentralis superior	—	—
	46.	S. postcentralis inferior (+) — fissura lateralis	—	+
	47.	S. interparietalis proprius continuous	—	—
	48.	S. interparietalis (+) — ramus ascendens s. temporalis superior	—	—
	49.	S. interparietalis (+) — ramus ascendens s. temporalis medius	—	—
	50.	S. interparietalis (+) — s. intermedius primus	—	+
	51.	S. interparietalis (+) — s. intermedius secundus	+	+
	52.	S. interparietalis (+) — s. occipitalis transversus	+	+
	53.	S. interparietalis (+) — s. parietalis superior	+	+
	54.	S. parietalis superior independent	—	—
	55.	S. parietalis superior number of sections	3	2
	56.	S. parietalis superior + sulcus præcunei	+	—
Temporal l.	57.	S. temporalis superior — anterior interruption present	+	+
	58.	S. temporalis superior — middle interruption present	—	—
	59.	S. temporalis superior — posterior interruption present	—	—
	60.	S. temporalis transversus, joining sulc. temp. superior	—	—
	61.	S. temporalis medius, number of sections	5	4
	62.	S. temporalis inferior, number of sections	2	2
Occipital lobe.	63.	S. lingualis independent	—	—
	64.	S. occipitalis anterior present	+	—
	65.	Arcus intercuneatus, superficial	+	+
	66.	Lobulus parieto-occipitalis present	—	—
	67.	S. occipitalis transversus inferior present	—	+
	68.	S. verticalis continuous with fissura retrocalcarina	+	+
	69.	S. lunatus present	—	—
	70.	S. paramesialis at the lateral surface	—	—
	71.	S. occipitalis medius (lateralis) + a s. temporalis	—	—
	72.	S. occipitalis medius continuous	+	—
	73.	S. occipitalis inferior independent	—	—
Limbic lobe.	74.	S. rhinicus externus joining the fissura lateralis	—	—
	75.	S. rhinicus internus present	—	—
	76.	S. collateralis — temporal interruption present	—	—
	77.	S. collateralis — fusiform interruption present	—	—
	78.	S. collateralis — lingual interruption present	—	—
	79.	Isthmus lobuli limbici concealed	—	+
	80.	S. subparietalis, number of segments	2	2
	81.	S. cinguli, number of segments	2	1
	82.	S. cinguli + s. subparietalis	—	+
	83.	S. intralimbicus present	—	—

+ means yes; — means no; L for the left hemisphere; R for the right.

TABLE B1.—*Particulars with respect to the Concealed Parts of the Cortex.*

	L.	R.
Transverse temporal divided	—	—
Sulcus postcentralis insulæ divided	—	—
„ præcentralis anterior, insulæ divided	—	—

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	L.	R.
Operculum orbitale number of sulci . .	1	0
,, frontale ,, ,, . .	0	0
,, centrale ,, ,, . .	8	8
,, parietale inferior . . .	1	0
Posterior Heschl badly developed . .	—	+
Deep gyrus in sulcus centralis . . .	—	—
Deep gyrus in sulcus interparietalis . .	1	1
Deep cuneus præcuneus superior gyrus .	1	1
,, ,, ,, inferior gyrus . .	—	1
,, lingualis anterior gyrus . . .	1	0
,, ,, posterior gyrus . . .	1	0

Temporal lobes.—The superior temporal (*ts*) has an anterior interruption in the left side only; on the right the annectant gyrus giving this interruption remains nearly concealed. The transverse temporal sulcus reaches the lateral surface on the left side, and a secondary branch ascends to it from the superior temporal, but there is 2 mm. distance between their ends. On the right side the *ttr* is not to be seen on the lateral aspect, and the secondary branch has half the size of the right one. The sulcus temporalis medius (*tm*) is several times interrupted on both sides and without regularity. The sulcus temporalis inferior (*ti*) is more regular, and only once interrupted.

Occipital lobes.—The left occipital lobe belongs to a very uncommon type. There is a marked cuneo-lingual gyrus, and a concealed anterior gyrus near the stem of the fissure. The fissure does not join the collateral sulcus.

On the left the calcarine fissure ends in a straight line; on the pole is a small vertical sulcus resembling a superior lunatus. Two well-developed, uninterrupted lateral sulci, not connected with the temporal sulci, run parallel with the end of the inferior temporal, which is at the lower border. The superior of these two lateral occipital sulci joins a well-formed anterior occipital, which does not join the transverse occipital. A deep gyrus exists at the described junction, and another more where the interparietal ends. Superadded to this there is a superior occipital and unusual deep incisure joining the inferior sagittal sulcus cunei; the superior sagittal is divided into two parts. There is no inferior transverse temporal. There is no evidence of a paramesial sulcus along the supero-mesial border, unless the deep abnormal incisure accounts for it.

The stem of the right calcarine fissure remains also separated from the collateral sulcus. There is a deep gyrus at the beginning of the retrocalcarine fissure and one at its end, just before the vertical end, which is well developed and remains at the mesial surface. Nevertheless, there is a prælunatus on the lateral surface. The three lateral

antero-posterior sulci are also seen here, but the lower is not continuous with the inferior temporal. The superior continues with the interparietal, without a deep gyrus. There is no anterior occipital sulcus. The transverse occipital is double, and the lower of them joins the interparietal.

The deep incisure, as described on the left side, exists also on the right side, and the superior occipital is independent. There is an independent inferior sagittal sulcus cunei, and a well-marked superior sagittal ending in a paramesial, which covers the superior half of the supero-mesial border of the cuneus. On the right side are two inferior transverse occipital sulci, the most posterior of them resulting from the polar sulci pushed downwards by the development of the lower end of the vertical calcarine sulcus, the most anterior being formed by the collateral and the lingual sulci.

Limbic lobes.—The limbic lobe is limited in both hemispheres by a quite simple boundary. The rhinal sulci do not join the lateral fissure. The sulcus collateralis is not interrupted. The isthmus is not concealed on the left side. The sulcus cingulatus is interrupted on the left side, where it belongs to type V of Retzius. On the right side this sulcus shows the common type in No. 1. On neither side is there a sulcus rhinicus internus.

Indices of Bilateral Comparison for the Lobes.

	12 male brains.	Pullen.
fl and *c* . .	76·4	80
Frontal lobes .	79·7	76
Parietal lobes .	69·2	62
Temporal lobes	61·9	83
Occipital lobes .	72·0	72
Limbic lobes .	68·5	70
	74·35	73

The greatest differentiation between left and right exists in the parietal lobes; the least in the temporal lobes.

The following table summarises the measurements of the depth of the sulci taken in eighteen places of the hemispheres on each side. As a means of comparison, the same measurements have been taken in a normal brain and in a heavy brain. Then the radius has been calculated for a sphere, the volume of which would be the same as the concerned hemispheres, and the percentage of the depth of the sulci according to that radius has been given.

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Depth of Sulci in Millimetres and Per Cent. of Radius.

	Pullen. L.	Pullen. R.	Normal. L.	Normal. R.	Heavy brain. L.	Heavy brain. R.	
Depth of primitive sulci	17·2	17·0	19·0	18·0	19·4	18·9	mm.
„ of newer sulci	14·7	15·4	16·0	15·0	18·5	18·0	„
„ of summa (mean)	16·3	16·8	17·8	16·8	18·8	18·2	„
Mean for both hemispheres	16·3		17·3		18·8		„
Weight of the hemispheres	1045		1055		1420		grm.
Radius of sphere (same vol.)	62·99		63·16		69·77		mm.
Per cent. of radius occupied by depth of the sulci	25·87		27·39		26·95		*per cent.*

Whence we see that the normal brain has comparatively the deepest sulci, the heavy brain less deep, and Pullen's brain the least deep sulci. Looking for details, it is to be noticed that this is not the case for the stem of the calcarine fissure on the right side in Pullen, nor in his sulcus cingulatus, nor in the sulcus collateralis. The rhinencephalon and the occipital region appear to have been the least affected by the arrest of development. The left hemisphere has suffered more in its accessori sulci than the right.

A microscopical examination has been made on different parts of the hemispheres, but the senile deterioration is too advanced to allow of any conclusions being made about the conditions that may have existed during Pullen's period of full mental strength.

Next to its documental value, the brain of Pullen may give us an interesting example for the study of the convolutional pattern in a small brain. For this study we would have to review which are the indications of a more simple pattern, as it is usually found in small brains of arrested development—these we would have to control by comparison with the characteristics of a more fully evolved type—and ascertain whether there is a predominance of one of these tendencies in the case of Pullen.

In order to do such descriptions with accuracy it would be necessary to have the results obtained in a sufficient number of brains, methodically tabulated in series. I am compiling such tables, but I cannot yet use them, as they are not worked out. The records obtained in the study of relative brains are of interest, and may show the modification of the familial pattern under the influence of differences in weight, and so allow us to trace which conditions are more likely to be inherited—independently of any other influence—and which are more under the influence of personal variability.(3)

The scheme of this study, however, is again not enough advanced to be completely demonstrative, and I have, therefore, used the results of Spitzka and Cunningham in addition to my own.

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Tokens of arrested development and simple pattern in the brain of Pullen:

1.(4) There is only one anterior ramus of the fissura lateralis in both hemispheres.

2. There is only one posterior ramus of the *fl* in the left hemisphere.

10. The sulcus centralis does not cut the supero-mesial border (on both sides), and it does not anastomose with *fl* at its lower end (No. 9).

23. The sulcus frontalis superior is in three sections on the left side (usually it is in one or two sections); on the right side it is in one section; it may therefore, be considered as badly developed on the left side.

28. The sulcus frontalis inferior is continuous on the left side, and not on the right side. This sulcus is interrupted in well-developed brains, but then the terminal portions anastomose with the neighbouring sulci, at least at the anterior end. Next, peculiarities observed show that such is not the case in Pullen. The right *fi*, therefore, is in better condition than the left, which is the contrary to what obtains in right-handed individuals.

29. *fi* does not anastomose with the sulcus diagonalis on the right side; it reaches *d* on the left side, without anastomosis.

30. *fi* does not anastomose with the sulcus radiatus (*r*).

31. Nor with the sulcus fronto-marginalis (*fmg*).

41. The sulcus interparietalis proprius is interrupted (*ip*).

50. There is an isolated sulcus intermedius anterior (*ima*).

56. The sulcus parietalis superior does not anastomose with the sulcus præcuneus (*s.pr*).

60. The pattern of the temporal lobe is not bad, except for the lack of anastomoses of the transverse temporal sulcus with the superior temporal, but the gyri are shallow, and there are but few secondary branches on the sulci.

61. There are too many divisions and too few connections in the middle temporal (*tm*).

76. The temporal interruption of *col* is present, as usually happens, when the speech centres on the lateral surface have not pressed the lateral cortex to the lower surface.

79. The isthmus lobi limbici is not concealed in the left hemisphere.

80. The sulcus subparietalis is interrupted in both sides.

82. The sulcus cinguli follows a simple pattern on both sides, type V on the left, type I on the right.

The former indications show that there is a greater lack or development in the left than in the right hemisphere.

Are there indications of superiority, or any peculiarities that might suggest that the brain belongs in some parts to a higher type of human evolution?

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67. The occipital lobe is well developed on both sides, and differences between the two sides are marked. On the left side there is a well-developed lateral anterior occipital, but a less marked inferior transverse occipital. On the right side there is an interruption of the calcarine fissure, which may be a familial characteristic. On the right side there is a good paramesial, which is evident on the lateral surface; on the left side the paramesial is interrupted. On both sides a deep sulcus which joins the sulci cunei gives an unusual type of greater complexity and deeper development of the occipital cortex, the distance from *rcal* to *tr* is smaller on the left side. The good development of the occipital region is more marked on the left side. Moreover, the occipital index is small, where the frontal and the parietal indices are larger than usual.

Corpus callosum.—The length of the corpus callosum exceeds the usual measurements; it nearly attains the same length as it does in brains of 1545 and 1593 grm., described by Spitzka. As the length of the callosum is one of the most constant familial characteristics, and as Pullen's parents were first cousins, the large development in Pullen's brain is likely to have resulted from a reinforced hereditary tendency.

Some unknown pathological factors had reduced the brain mass, and especially arrested the development of the central, temporal, and frontal lobes. As is usually the case under such circumstances, the left side was more affected than the right side. The large development of the corpus callosum, in addition to the better preservation of the occipital lobes, may have been of no little importance as regards the visual capacity and the artistic skill that gave Pullen, with his perseverant and tenacious character, the means of attaining a personal originality and distinction.

Tredgold, after careful examination, came to the conclusion that the case was not one of *primary* amentia, but that it should really be classed as an example of mild *secondary* mental deficiency, due to sense deprivation (deafness). "The condition," he writes, "is similar in kind, although differing in degree, to that frequently seen in neglected cases of congenital deafness, and it is not greatly dissimilar to that of some non-idiotic savants, who, absorbed in their one particular subject, have gradually lost interest in, and severed their connection with, the outer world."

Every discussion about classification of mental cases has always proved to be fruitless, except for the demonstration of new facts enabling one to modify accepted opinions. Much can be said in favour of Tredgold's conclusions, but clinical classifications are often too artificial. When a complete examination can be performed, many cases of so-called primary amentia may be considered as secondary to some localised

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pathological influence, which has caused the arrest of development of the brain, or impeded education by the severance of social connections.

Pure hereditary influence, affecting the whole of the brain in an harmonious manner, is hypothetical. Through heredity, pathological influences act by local processes and disharmony.

At first sight I thought it possible to compare the brain of Pullen, which appears almost well fissurated, with those cases of infantilism as described under the name of "Type Lorrain." But I had soon to abandon so hazardous an opinion. The brain is small, its frontal and temporal lobes are badly developed; there is a lack of complexity in the convolutional pattern of these lobes, and this is especially marked in the speech centres; his deaf-mutism was more central than peripheral in origin. The parietal lobes were not so bad; the occipital lobes were good, the corpus callosum was remarkable, and *he was bound to have special capacity in the visual sphere of his mental existence.*

I have never thought it possible to explain by the description of the brain, why Pullen was so tenacious and so industrious. Just as the complexion—may it have been the internal secretions that granted him a sound long life?—the foundation of his character was not only to be found in his convolutions.

"Science has done much for us," says Carlyle, in his *Hero Worship;* but it is a poor science that would hide from us the great deep sacred infinitude of Nescience, whither we can never penetrate, on which all science swims as a mere superficial film. This World, after all our science and sciences, is still a miracle; wonderful, inscrutable, *magique*, and more, to whosoever will *think* of it."

And so was Pullen.

(1) The brain of this interesting case was sent to Lt.-Col. Mott by Dr. Caldecott, who handed it to Dr. Sano for investigation, who acknowledges with gratitude a grant from the Medical Research Committee of the National Health Insurance.—(2) A. F. Tredgold, *Mental Deficiency*, second edition, London, 1915. Contains a complete record of Pullen's activity, illustrated by numerous figures. The figures which I give in this paper have not hitherto been published.—(3) "Convolutional Pattern of Relative Brains in Man," *Proc. Roy. Soc. Med.*, 1917; *Id.* in "Identical Twins" (*Philosoph. Trans. of the R.S.*, 1916). F. Sano.—(4) The numbers refer to those of Table B.

An Ectromelus (1)*: An Atavistic Relapse.* By S. B. Pal, B.A., L.M.S. (Cal. Univ.), Assistant Surgeon, Central Asylum, Federated Malay States.

Darwin, after a most comprehensive and searching investigation of the phenomena of life and variation, came to the conclusion that "man is the co-descendant with the other mammals of a common progenitor," and still "bears in his bodily frame the indelible stamp of his lowly