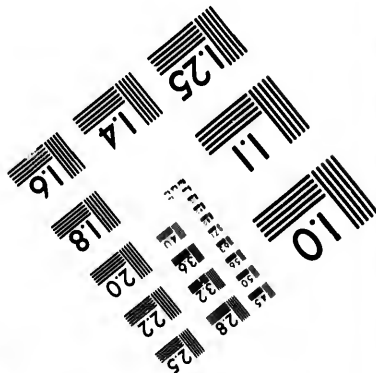
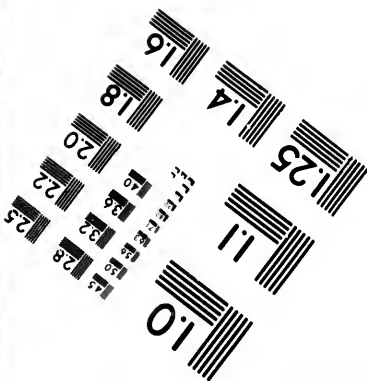
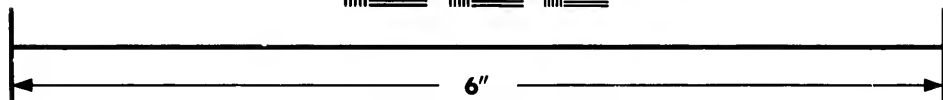
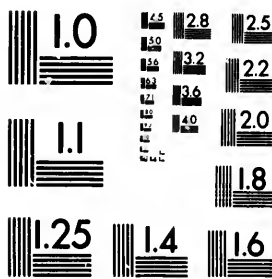


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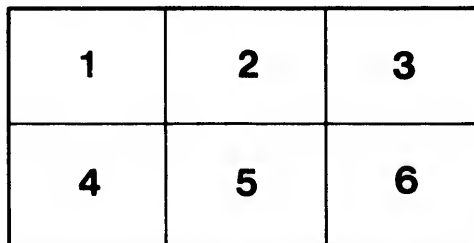
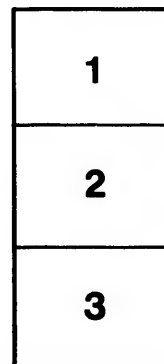
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FEBRUARY, 1882.

ON THE BRAINS OF CRIMINALS.

WITH A DESCRIPTION OF THE BRAINS OF TWO MURDERERS.

BY WILLIAM OSLER, M.D., M.R.C.P., Lond.

Professor of the Institutes of Medicine in McGill University, and Physician to the Montreal General Hospital.

[Read before the Medico-Chirurgical Society of Montreal.]

Mentally and bodily, we are largely the result of an hereditary organization, and the environment in which we have been reared. The child of a bushman nurtured in the family of a philosopher will be able, with favourable surroundings, to rise much above his race level; the child of a philosopher, reared among the bushmen, will not reach his paternal standard, but the grossness of the savage natures around him will have weight to pull him down, and what is fine will learn to sympathize with the clay. In the former case, the individual cannot transcend his organization; and in the latter, he cannot burst the iron bars of his environment. That the mental and moral status of a man is determined by the conformation and development of his brain is an axiom with the school of physiological psychologists. The conformation is a matter of inheritance; the development, of education (in its widest sense). The different mental conditions of individuals are the expression of subtle differences in cerebral structure, just as the diversity in the features of men is the result of minute variations in the arrangement of the tissues

of the face. That a faulty physical basis can have no other sequence than a faulty mental and moral constitution is acknowledged and acted upon by every one, so far as idiots and imbeciles are concerned, but that mental and moral obliquity is invariably the outcome of an ill-conformed or ill-developed brain is a doctrine novel and startling, though logical enough from the standpoint of modern physical fatalism. Endeavours have recently been made to put this theory on firm grounds by showing that in a large number of criminals the type of brain differs from that in the law-abiding members of the community.

Anatomists and physiologists have of late paid much attention to the conformation of the brain surface, and the convolutions and fissures are now studied with care and minuteness. In a typical European brain, the cerebellum is completely covered by the cerebrum, and the general arrangement of the gyri and sulci is such that there is rarely any difficulty in mapping them out and assigning their proper names to each. Thus on the external surface of each hemisphere we recognize two fissures which are constant and invariable in position—the *fissures of Sylvius and of Rolando*, (*central sulcus*.) Other fissures constantly present, but less definite in their arrangement, are: the *inter-parietal*, which passes through the parietal lobe, the *parieto-occipital*; separating the parietal and occipital lobes, best seen from the median surface, the *superior* (1st), *inferior* (2nd), and *ascending* (3rd) frontal sulci and the 1st and 2nd *temporal*.

On the median surface, the *calloso-marginal*, the *parietal-occipital*, the *calcarine* and *collateral* are well marked and distinctive.

The convolutions or gyri separated by these fissures are remarkably uniform, and, though often intersected by subsidiary sulci, can usually be determined without difficulty. Of these, the only ones which need be now mentioned are the three frontal, 1st, 2nd and 3rd, the general direction of which is parallel to the longitudinal fissure and the two central gyri which bound the fissure of Rolando on either side.

In the typical brain the main fissures are unconnected with each other; thus the fissure of Rolando is isolated and does not

unite with the Sylvian fissure below, or the ascending frontal or ascending parietal sulci on either side. The Sylvian fissure does not join with any of the sulci above or below it.

Prof. Benedikt of Vienna has made a special study of the brains of criminals,* and believes that he has met with peculiarities sufficiently marked to warrant the following proposition: "*The brains of criminals exhibit a deviation from the normal type, and criminals are to be viewed as an anthropological variety of their species, at least amongst the cultured races.*" The two peculiarities on which he lays stress are (1st) the confluence of many of the primary fissures and (2nd) the existence of four horizontal frontal gyri. He proposes to establish a confluent fissure type of brain, and he illustrates its most important characteristic by saying, "that if we imagine the fissures to be water-courses, it might be said that a body floating in any one of them could enter almost all the others." This, of course, means the absence of numerous bridges of nerve matter which normally separate the fissures—defects, marking an inferior development of the brain. Between the normal type with isolated fissures and the type with confluent fissures there will naturally be transitions, but he calls attention to the number and variety of the connections in his series of the brains of 22 criminals as supporting the truth of his proposition. He states that the brains of individuals in the lower grades of society approach nearer to the 2nd type, and it is probable, though, as yet, full data are wanting, that the brains of the inferior races of men also conform more closely to this than to the type with isolated fissures. Let us see now how far he has been able to establish the truth of this view. Of 38 hemispheres from the 22 criminals the following were some of the most interesting points:—

I. The *fissure of Rolando* communicated with :

- (a) *fis. Syl.* completely in 18, incompletely in 6.
- (b) with *3rd* or *ascending frontal*, complete in 11, incomplete in 2.

* On the Brains of Criminals, Vienna, 1879. Translated by Dr. Fowler. (Wood & Co., New York, 1881. *Cent. f.d. med. Wissenschaften*, 1876, and No. 46, 1880.

(c) with the 1st or *superior frontal sulcus*, complete in 9, incomplete in 1.

(d) with *inter-parietalis*, complete in 7, incomplete in 4.

Of the 19 brains there was not one in which the *fissure of Rolando* had not on one side a connection with some other fissure. Altogether there were 58 connections, 35 on the left and 23 on the right side.

II. The *Sylvian fissure* communicated with :

(a) *fis. R.* in 18 completely, in 6 incompletely.

(b) with *frontal sulci* in 18, incomplete in 7.

In 7 brains it existed on both sides ; only absent on both sides in 3.

(c) with *fis. inter-parietalis* in 22, incomplete in 6.

(d) with 1st *temporal* in 18, incompletely in 4.

III. The *fis. inter-parietalis* communicated with :

(a) *fis. R.* complete in 7, incomplete 4.

(b) *fis. Sylv.* complete 22, incomplete 7.

(c) 1st *T.* complete 19, incomplete 6.

In the 38 hemispheres there were 51 complete and 16 shallow connections of the *inter-parietalis*.

IV. The *scissura hippocampi* communicated with :

parieto-occipital, complete 17, incomplete 2.

V. The *calloso-marginal fissure* :

with *parieto-occipital*, complete 8.

VI. The *parieto-occipital* :

with *inter-parietalis* and *horizontal occipital*, complete 21, incomplete 6.

These were the most important connections ; the others I shall not refer to.

The second peculiarity which Prof. Benedikt has noted in the brains of criminals is the existence of 4 horizontal gyri springing from the ascending frontal or anterior central convolution. This he regards as an animal similarity, and a reversion, so to speak, to the typical four primitive gyri of the brains of carnivora. The fourth gyrus is formed by the splitting, by a deep fissure, of either the 1st or 2nd convolution. In his latest communication

on this point,* the results are given of the examination of 87 hemispheres (from 44 criminals), of which only 42 presented the normal type of frontal convolutions, and 27 showed four gyri. In these the additional gyrus resulted in 8 from the splitting of the superior; in 16 from the division of the middle convolution. In 13 there was an imperfect division into four gyri. In two hemispheres there were five frontal convolutions.

Through the courtesy of Dr. Desmarteau, Jail Surgeon, I was present at the autopsy, and secured the brain of the man Hayvern who was executed for the murder of a fellow-convict; and the Department of Justice permitted me to secure the brain of Moreau, who was executed at Rimouski.

I.—Hayvern, aged 28, was a medium-sized man, of no trade; Irish descent; parents living, and respectable; no insanity, inebriety or neurotic disease in the family. He had been a hard drinker, and as a child was stated to have had fits. There is no evidence of the recurrence of these in adult life. He was serving a term in the Penitentiary, having been sentenced for highway robbery in 1879. He had previously been in jail more than twenty times, and may be taken as a good representative of the criminal class. The details of the murder show deliberation, and there was no evidence to show that the act was performed during a paroxysm of epileptic mania.

The skull was somewhat ovoid in shape, dolicho-cephalic; the forehead rather low and retreating. The calvaria was of moderate thickness; no signs of injury, old or recent.

Brain, last organ examined. Pl. I.—Vessels were empty; drained of blood by the opening of the vessels of the neck, both in front and behind. Membranes were normal. Weight of organ, 1326 grammes (46½ ozs.) Cerebellum completely covered by cerebrum. I obtained the left hemisphere for special study, and the details of its structure are as follows:—

Antero-posterior diameter.....	16.5	cm.
Hemispheric arch.....	24.8	"
Anterior curve (tip of Fr. lobe to Fis. Rol.).....	14	"
Middle curve (from Fis. Rol. to Par.-occip. Fis.).....	6.2	"
Posterior curve (from Par.-oc. to tip of Occip. lobe) ..	4.8	"

* *Centralb. f.d. med. Wissenschaft.*, No. 46, 1880.

Sylvian fissure (Fig. 1), in addition to the normal *ascending* and *horizontal* rami, presents a radial branch which passes into the *frontal gyri* (a), a short radial extension into the *asc. parietal* (b), and a shallow communication with *retro-central sulcus* (c).

The *fissure of Rolando* (F.R.) or *central sulcus* is separated from the F.S. by a very narrow bridge of brain substance. It has no other connections.

There are four well-marked *frontal gyri* [1, 2, 3 and 4]; the extra one (2) appears to be formed by the splitting of the *superior* or *1st gyrus*, though its base, where it joins the *asc. front. gyrus*, is in the position of the *middle* or *2nd. fr. gyr.* As can be seen in the plate, there are two radial sulci which pass from a point just behind *asc. ramus of fis. Sylv.* and ascend almost to the *long. fis.* They are deep, and the hinder one has a crucial extension in the position of the *2nd fr. sul.*

The *sulcus inter-parietalis* presents a well-marked radial portion which passes up behind the ascending parietal convolution in its whole length (*asc. pariet.* or *retro-central sulcus*); the sagittal part passes back into the parietal lobe and divides into two branches, one of which (d) curves round the *supra-marginal gyrus* and unites with the *1st temporal fis.*; the other (e) ascends to the median border, and is continuous with a sulcus which joins the *parieto-occipital.*

The *asc. par. gyrus* (retro-central) is well developed, as are also the *angularis* and *supra-marginal.*

The *horizontal* (or *sup.*) *occipital sulcus* is well developed; it does not join the *par. occip.*, but sends branches into the *gy. cuneus.* It appears to join the *2nd temp. sulcus*, but the brain is lacerated at this point, and it is difficult to make out the connection.

The *1st temporal sulcus* is strongly marked, passes up and joins the *inter-parietal.* The *2nd temp.* cannot be well made out on account of the laceration.

On the median surface (Fig. 2), the *calloso-marginal sulcus* is strongly developed, presents numerous perpendicular branches, and terminates by two, one of which (f) ascends to the usual position behind the *retro-central gyrus*, the other (g) curves

round and divides the *gyrus fornicatus* from the *pre-cuneus* (or quadrilateral), extending to within a short distance of the calcarine fissure, and uniting with the *fis. cruciata*.

The *gyrus fornicatus*, in the anterior half of its extent, presents a well-marked sulcus running along its centre.

The *parieto-occipital* is deep and well marked ; it has a branch (*h*) which curves over the border and unites with the *inter-parietal*. The *calcarine* fissure unites with the *par. occip.*, and the conjoined sulcus communicates with the *scissura hippocampi* by a wide groove (*i*).

The *sulcus collateralis* joins the *calcarine* by a large fissure (*j*), which ends just at the handle of the fork of the *par.-occip.* and *calcarine*. Another sulcus (*k*) passes from it round the under surface of the occipital lobe, dividing the *temporal gyri* from the *occipital*.

The *orbital gyri* are separated from the frontal anteriorly, by a well-marked fissure (fronto-marginal of Wernicke).

The convolutions of the *insula*, normal.

According to Benedikt's views, this hemisphere is atypical in the following particulars:—

a) The union of the *Sylvian* with the 1st *frontal sulcus*.

b) The junction of the *inter-parietal* with the *parieto-occipital* and with the 1st *temporal*.

c) The extension of the *calcarine* fissure into the *scissura hippocampi*.

d) The extension of the *calloso-marginal* fissure between the *gyrus fornicatus* and the *pre-cuneus*.

e) The union of the *collateral* and *calcarine* fissures.

f) The fission of the 1st frontal convolution into two parts, so that there appear to be four frontal gyri—a condition which Benedikt lays great stress upon as a marked *animal similarity* in the human brain.

II.—Moreau, a small farmer in the county of Rimouski, aged 40, French-Canadian, murdered his wife last summer, and was executed on the 13th of January. He was a short, very powerfully-built man, uneducated, and of a morose disposition ; was temperate, and had never before been convicted of any crime.

He had not lived happily with his wife, and quarrels had been frequent: one day, when in the woods together, he cut her head open with an axe. The deed was apparently premeditated, as it came out in evidence that he had offered money to a man to do it for him. After the act and during the trial he maintained his usual stolidity, and did not appear to take a very deep interest in the proceedings. Indeed, it is stated that he was unaware, until some time after the sentence, that he was to be hanged. The autopsy was performed, about an hour after his death, by Dr. Belleau, and the brain was secured by H. V. Ogden, B.A., and brought to me in excellent condition for examination.

Organ large, weighed about 1587 grms. (56 ozs). [Pl. II.] The hemispheres, though large, did not completely cover the cerebellum. Membranes were normal; vessels of the pia mater and the subjacent grey matter deeply engorged.

Left hemisphere (Pl. II., fig. 3).—*Fis. Sylv.* is separated from ascending *parietal* by a very narrow and grooved gyrus, and joins the *inf. front.* by a shallow sulcus (a).

Fis. Rolando sends a deep fissure (b) across the upper end of *asc. par. gyr.*, which curves round the margin and unites with *fis. cruciata* of the *pre-cuneus*. There is not a well-marked *asc.* or *3rd front. sul.* The *1st fr. sul.* has a short vertical branch, and only extends for 2.5 cm. from *asc. front. gyr.*, when the 1st and 2nd convolutions fuse, but beyond this it is again apparent. *2nd front. sul.* has a short vertical branch, and joins the *fis. Sylv.* by a narrow groove. Its anterior extension is well developed. The *3rd front. gyr.* is large in comparison with the 1st and 2nd. The *asc. front. gyr.* is large.

The *asc. par. sul.* (retro-central), which is usually united with the inter-parietal, and called its radial portion, is isolated, and only joins the *fis. Sylv.* by a shallow furrow (c). The *asc. par. gyr.* is narrow.

The *inter-parietal fis.* runs almost parallel to the *asc. par.* and *fis. Rol.*, being separated from the former by a narrow convolution which joins the *sup. parietal lobule*. Below it joins the *1st temp. sul.* (d); above it does not extend to the margin. Gyri of parietal lobe well developed.

The 1st temp. sul. is crossed in two places by bridging gyri uniting the 1st and 2nd convolutions. Posteriorly this sulcus has two branches—one which joins the *i. par.*, the other the *inf. occip.* The 2nd temp. sul. is not well marked.

The *sup. occip. sul.* joins the *par. occip.*; the *inf. occip. sul.* the 1st temp.

On median surface, *par. occip. fis.* unites with *sup. occip.*, and by a shallow sulcus with *fis. cruciata* of *pre-cuneus*.

Calcarine fis. normal; *cuneus* small.

Fis. collateralis long, and sends numerous fissures into *gyri linguales* and *fusiformis*.

Sul. calloso-marg. has many fissures entering the 1st front. *gyr.* *Gyr. fornicatus* is fissured longitudinally. *Orbital gyr.* normal; well marked *frontal marginal sul.* No external orbital fissure. *Insula* well developed, and has 9 gyri.

Right hemisphere (Pl. II., fig. 4).—*Fis. Sylv.* joins 3rd or *asc. front. sul.* (a), and the *asc. par. (b)* (retro-central) by shallow furrows. *Fis. Rol.* unites with 1st front. (c) and *asc. par. (d) sulci* by narrow grooves.

The *asc. front. sul.* arises by a shallow fissure from the *fis. Sylv.*, and then at the base of the 2nd front. *gyr.* joins the 2nd front. sul. 1st, 2nd and 3rd frontal gyri are well developed and distinct posteriorly. Anteriorly they are fused and crossed by many secondary sulci. *Asc. frontal gyr.* is very narrow in its centre.

Inter-parietal fis. has a well marked radial portion (the *asc. par.* or retro-central). The sagittal part passes back and presents three divisions—one (e) enters the *sup. par. lobule*, a second (f) passes directly back and joins a fissure in the position of *inf. occip.*, which reaches to the tip of occip. lobe, and the third (g) part passes vertically down and unites with 1st temp. sul. and has a branch which crosses the 2nd temp. *gyr.*

Asc.-par. convolution is large below, narrow above. The *angular, supra-marginal* and *sup. par. lobule* are much fissured.

1st temp. sul. joins *i.-par.*; the 2nd is not marked. Several oblique sulci cross the 2nd and 3rd temp. *gyr.* *Sup occip. sul.* joins *par. occip.*

On the median surface, *par. occip. fis.* joins *sup. occip.*; the *calcarine* enters *scissura hippocampi* and joins the *fis. collateralis* by a shallow groove. *Fis. collateralis* large and deep.

The *cuneus* is small; *pre-cuneus* (lob. quad.) is large and its anterior boundary ill-defined.

Calloso-marginal fis. extends to level of base of 1st frontal, and then curves up to the margin of the hemisphere, being interrupted by a broad annectant uniting the *gyr. fornicat.* with 1st front. Beyond this there is a short extension which joins a complex series of sulci in the *pre-cuneus*.

Orbital gyri normal. There is a narrow *fronto-marginal sul.* There is a well-marked *external orbital fissure*.

The chief points to be noted are :—

1. The absence of complete covering of cerebellum by cerebrum.
2. On both sides the *pre* and *retro-central fissures* were separated from *fis. of Sylvius* by very narrow and grooved gyri.

3. The left *fis. Rolando* joins *fis. cruciata* of *pre-cuneus*, and on the right side it is imperfectly separated from 1st front, and *asc. par. sulci*.

4. The *inter-parietal*, on both sides, joins the 1st temp. sul., and on the right side is much more developed and joins the *occipital*.

5. On the median surface the *calcarine* on the right side enters the *scissura hippocampi*.

There remain two questions for consideration : first, to what extent does Professor Benedikt's confluent fissure type of brain prevail among ordinary members of the community, and how far is it reliable as an indication of defective development ?

With a view of ascertaining how far the confluent fissure type of brain exists among the lower classes in this community, I have examined carefully 63 hemispheres from 34 individuals, all of whom were patients in, and died at, the General Hospital. Most of these were preserved by Giacomini's method, and as no special note exists as to the social standing or character of any of the individuals from whom they were obtained, the results are of value only so far as they show to what extent confluence of fissure occurs in that class from which the Hospital wards are recruited.

1. The Fissure of Rolando communicated with—
 - a. *Fissure of Sylvius*, in 3 completely, in 7 incompletely.
 - b. *Frontal sulci*, complete in 12; incomplete, 9.
 - c. *Inter-parietal sulci*, complete in 7; incomplete, 9.
2. The Fissure of Sylvius joined—
 - a. The *F. R.* [see above.]
 - b. The *frontal* in 20.
 - c. The *inter-parietal*, complete in 26; incomplete, 8.
 - d. The *1st temporal*, in 15.
3. The Inter-parietal united with—
 - a. The *F. R.* [see above].
 - b. The *F. S.* [see above].
 - c. The *parieto-occipital* in 18.
 - d. The *horizontal or sup. occipital* in 14.
 - e. The *1st temporal* in 19.
4. The *Calcarine* entered the *scissura hippocampi* in 25.
5. The *calloso-marginal* joined the *par.-occipital* in 1.
6. The *parieto-occipital* joined—
 - a. The *inter-parietal* in 18.
 - b. The *horizontal occipital* in 3.

From these limited observations we may conclude—

1. That a considerable proportion of the brains of Hospital cases are of the confluent fissure type.

2. The chief difference to be noted between Prof. Benedikt's series of criminals' brains and those which I have just gone over is the somewhat greater number of unions between typical fissures, more particularly between the *fis. Rol.* and contiguous ones. Thus in his set this fissure connected, completely or incompletely, with the *fis. Syl.* in 24 instances; in my series in only 10. In the other fissures the disproportion is not nearly so great.

3. Considering the number of brains of ordinary Hospital patients which present in some degree the confluent fissure type, it would seem more reasonable not to assign as yet any special significance to it until we have fuller information about the arrangement of the convolutions in the various races, and until a much larger number of the brains of criminals of all countries have been examined.

Professor Benedikt's cases were nearly all Slavonians or Hungarians, and though Betz of Kieff, a leading authority, acknowledged the atypic of his specimens, it would have been more satisfactory to have had a comparison between these specimens and an equal number taken from law-abiding members of the same races. It may be urged that in Hospital patients the brains should conform in considerable numbers to this 2nd or confluent fissure type, as many of them are individuals in the lower ranks of life, and not a few belong to the criminal class. This applies, however, much more forcibly to dissecting-room material, which, as Dr. Benedikt says, "consists of the remains of those who have suffered complete shipwreck in life through low grade of intelligence, imperfect motor development, or through crimes and vice." In the series of brains which I examined, there were no dissecting-room specimens, and it did not include the brain of any notorious criminal so far as I am aware.

As to how far confluence of fissures is indicative of a low type of cerebral organization we also want fuller information. When existing in high degree, there is certainly an absence of many important annectants or bridging areas of brain substance, but when we consider the variable size of convolutions bounding the typical fissures, it is easy to see that defect in one part might be more than compensated for by excess in another part, and even a neighbouring part. In several of the brains which I examined, notably No. 10, the confluent fissure type existed in an organ with a rich convolution system. In the brain of Moreau, the retro-central fissure on the left side was separated from the inter-parietal by a distinct gyrus, which might as well be regarded as an excess, as absence of an annectant and confluence of two fissures might be considered a defect.

With reference to the type of four frontal convolutions which Prof. Benedikt has found in such a large number of his specimens, I will only say that in 10 of the hemispheres examined it was observed in a greater or less degree of development. Nowhere was it better seen than in the brain of Hayvern. To enter upon the anatomical significance of this would be beside the question on this occasion.

Professor Benedikt's conclusions are those of a thoroughgoing somatist, who would bring all human conduct within the range of organic action. "The constitutional criminal," he says, "is a burdened individual, and has the same relation to crime as his next of blood kin, the epileptic, and his cousin, the idiot, have to their encephalopathic conditions." And again, "the essential ground of abnormal action of the brain" (*i.e.*, I take it, bad conduct.) "is abnormal brain structure. His 44 criminals were what they were because of defects in the organization of their hemispheres: they belonged to the *criminal variety* of the *genus homo*. No wonder he says "that this proposition is likely to create a veritable revolution in ethics, psychology, jurisprudence and criminalities." He wisely adds that it should not yet serve as a premise, and should not, for the present, leave the hands of the anatomists, since it must be repeatedly proven before it can finally rank as an undoubted addition to human science.

Crime is commonly regarded as the result of yielding to an evil impulse which could have been controlled; and this element of *possible control* is what, in the eyes of the law, separates the responsible criminal from the irresponsible lunatic. The belief in a criminal *psychosis* is spreading, and is the outcome of sounder views of the relation of mind to brain; and these investigations of Prof. Benedikt, to which I have so frequently referred, may serve as a foundation to a natural history of crime. But if this *is* the case, how are we to regard our criminals? What degree of responsibility can be attached to the actions of a man with a defective cerebral organization? Where is there scope to eschew the evil and to do the good, when men are "villains by necessity, fools by heavenly compulsion, knaves, thieves and traitors by spherical predominance." Any one who believes that with all our mental and moral processes there is an unbroken material succession, must consistently be a *determinist*, and hold, with Spinoza, that "in the mind there is no such thing as absolute or free will, but the mind is determined to will this or that by a cause which is determined by another cause, this by yet another, and so on to infinity." For a long time to come, how-

ever, the majority of individuals—including some who are inconsistent in so doing—will continue to hold the *intuitionist* view, nowhere better expressed than by Shakespeare, when he puts into the mouth of that arch-criminal, Iago, the words: “ ’Tis in ourselves that we are thus and thus. Our bodies are our gardens to the which our wills are gardeners; so that if we will plant nettles or sow lettuce, set hyssop and weed up thyme, supply it with one gender of herbs or distract it with many, either to have it sterile with idleness or manured with industry, why, the power and corrigible authority of this lies in our will.”

“ Theft and murder,” as Huxley well says, “ would be none the less objectionable were it possible to prove that they were the result of the activity of special theft and murder cells in the grey pulp.” One thing is certain, that, as society is at present constituted, it cannot afford to have a class of *criminal automata*, and to have every rascal pleading faulty grey matter in extenuation of some crime. The law should continue to be a “ terror to evil-doers,” and to let this anthropological variety (as Benedikt calls criminals) know positively that punishment will follow the commission of certain acts, should prove an effectual deterrent in many cases, just as with our dogs, the fear of the whip exercises a restraining influence—immediate as well as prospective—on the commission of canine crimes.

The Brains of Criminals.—Dr. Osler read a paper on this subject, and recorded the results of an examination of the brain of the murderer Hayvern, who was executed at Montreal on 11th Dec., 1881. (See page 385.) He first referred to the observations of Benedikt of Vienna, who, in 87 hemispheres from 44 criminals, has found certain peculiarities which he regards as indicative of a lower type of cerebral organization. The points upon which he most dwells are the confluence of many of the principal fissures, and the existence in a considerable proportion (27 of the 87) of four frontal gyri, the fourth being formed by the splitting of the first or second gyrus. This is regarded as an animal similarity. Hayvern was a low, dissolute fellow, addicted to drink, with no special neurosis in his family, who, on June 29, stabbed a fellow-

convict. The brain weighed $46\frac{1}{2}$ ozs., and was fairly well formed; the cerebellum was completely covered by the cerebrum. On examination it was found to conform in many respects to Benedikt's cases, and was atypical, according to his views, in the following particulars: The union of the Sylvian fissure with the first frontal gyrus; the junction of the inter-parietal with the parieto-occipital and first temporal fissures; the extension of the calcarine fissure into the scissura hippocampi; the union of the collateral and calcarine sulci, and in the fusion of the first frontal gyrus, so that there appeared to be four frontal convolutions arising from the ascending frontal or anterior central gyrus. To ascertain how far these peculiarities existed in the brains of hospital patients, Dr. Osler examined 43 hemispheres from 24 individuals, and found that a very considerable proportion were of the confluent fissure type. Thus, the Sylvian fissure joined the fissure of Rolando in 8 hemispheres, the frontal sulci in 18, the interparietal in 19, and the first temporal in 12. The chief difference between Benedikt's series of brains of criminals and those examined was a greater number of unions between the typical fissures, more particularly the fissure of Rolando, which in the former joined contiguous sulci in 24 instances. In 9 of the 43 hemispheres there were four more or less distinct frontal gyri. He thought that much fuller information was needed about the arrangement of the sulci in the different races, and many more criminals would have to be examined before any positive result was arrived at as to the constant atypical character of the brain in members of this class. Speaking of Benedikt's conclusions, he questioned whether it was wise to speak of criminals as an anthropological variety of their species. On his views there is no place left for responsibility; but society cannot afford to have a class of criminal automata, and every rascal pleading faulty gray matter in extenuation of his crimes.

Dr. Henry Howard (~~Med. Supt.~~ Longue Pointe Asylum) asked if it were known how many of the brains of the series of hospital cases were from criminals, and whether a larger proportion presented abnormalities than could be reasonably thought to belong to this class. He believed in a criminal class as distinct as a

to be a class

mercantile class, and regarded the mental and moral condition of the individuals belonging to it as dependent absolutely on their physical organization. Hayvern was not responsible for his act; it was not premeditated, but performed under the influence of an uncontrollable impulse; and he thought that there was evidence to show that it may have been connected with the epileptic neurosis.

Dr. Hingston wanted to know how it was, if viciousness and crime were the product of defective cerebral organization, that some notoriously wicked men had reformed and lived sober and honourable lives? Was it probable that with such a change there was any alteration in the structure of the brain?

Dr. Cameron thought that, for Benedikt's conclusions to have any value, it must be shown that criminals have invariably atypical brains and all other people normal ones. Most criminals have some degree of control over their actions, and the law is an effectual deterrent in many instances, particularly where the penalty enacted touches the person. He illustrated the rapid abolition of garroting by the introduction of the lash, and quoted facts to show the good effects of capital punishment.

Dr. Shepherd remarked that it was somewhat difficult to say what was the typical brain. The majority of observations were upon the lower classes; we lacked data as to the arrangement of the fissures and convolutions in a large number of the intellectual members of society. He had frequently seen brains of the confluent fissure type in the dissecting-room.

Dr. Mills said that, with reference to the series of brains from hospital patients examined by Dr. Osler, the question arises as to how far such patients belong to the criminal class. In about one thousand patients that he had observed closely, he did not think that many of them ranked in this class.

Dr. Osler, in reply to Dr. Howard's question, stated that the series of brains which he had examined were nearly all preserved by Giacomini's method, and no data existed from which the social status of the individuals could be ascertained. In the 43 hemispheres (19 perfect brains and 5 halves), 19 presented one or more atypical features.

