Tribune in these cases, which were submitted to the authors on the 4th of December last for correction or rejection; no objection being made we printed them in a recent number. After publication Professor Agassiz now writes that the reports under his name are not satisfactory to him. We therefore request our readers to consider them withdrawn.

Professor George F. Barker, Professor O. C. Marsh and Professor J. E. Hilgard are preparing more elaborate reports of their important papers, and promise them at an early day.

THE BRAIN OF THE ORANG.*

BY HENRY C. CHAPMAN, M.D.

The brain of the Orang has been figured by Tiedemann, Sandifort, Schroeder van der Kolk and Vrolik, Gratiolet, Rolleston, etc. On account, however, of the few illustrations extant, and of the importance of the subject, I avail myself of the opportunity of presenting several views of my Orang's brain (Figs. 1 to 5), which was removed from the skull only a few hours after death. The membranes were in a high state of congestion, and a little of the surface of the left hemisphere had been disorganized by disease, otherwise the brain was in good condition. It weighed exactly ten ounces. The brain of the Orang in its general contour resembled that of man more than those of either of the Chimpanzees which I examined. In these the brain was more elongated. The general character of the folds and fissures in

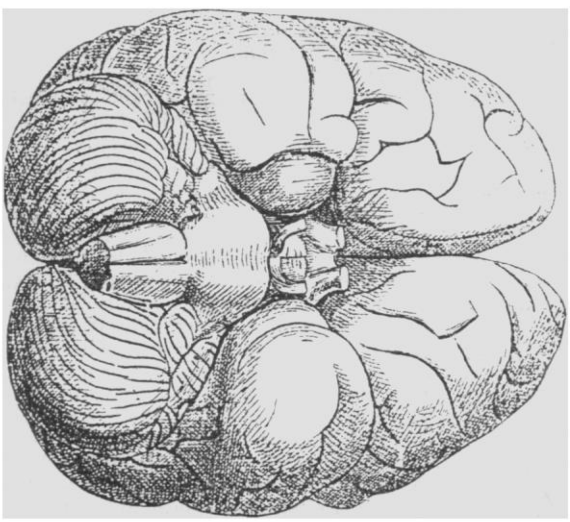

FIG. 1.

the brain of the Orang, Chimpanzee, and man are the same; there are certain minor differences, however, in their disposition in all three. The fissure of Sylvius in the Orang runs up and down the posterior branch pursuing only a slightly backward direction; the anterior branch is small. The fissure of Rolando, or central fissure, quite apparent, is, however, situated slightly more forward in the Orang than in man. It differentiates the frontal from the parietal lobe. The parieto-occipital fispure is well marked; bordered externally by the first occipital fold it descends internally on the mesial side of the hemisphere, separating the parietal from the occipal lobes.

* From the Proceedings of the Academy of Natural Sciences, Phila., 1880.

in the Orang, the parieto-occipital fissure does not reach the calcarine, being separated from it by the "deuxième plis de passage interne" of Gratiolet, or "untere innere Scheitelbogen-Windung" of Bischoff. I have noticed this separation as an anomaly more than once in man.

According to Bischoff, this disposition obtains in the Gorilla, and seems to be usual also in the Chimpanzee. In the female Chimpanzee, however, on the left side I found the parieto-occipital fissure passing into the calcarine, as in man. The frontal lobe is easily distinguished from the parietal by the fissure of Rolando, and from the temporal by the fissure of Sylvius. In the Orang it is higher, wider, and more arched than in the Chimpanzee. The anterior central convolution in front of the central fissure runs into the post-central convolution above and below, as in man. It is difficult, however, to identify the three frontal convolutions seen in man and the Chimpanzee, the frontal lobe of the Orang dividing rather into two convolutions, the middle one being badly defined. This is due somewhat to the length of the precentral fissure, which is as long as the fissure of Rolando, extending farther upward than in man. There was nothing particularly noticeable about the base of the frontal lobe; on the mesial surface it ran into the parietal. The part above the calloso-marginal fissure in the Orang is not as distinctly divided into convolutions as in man, though these are not constantly present even in all human brains. The parietal lobe is separated from the frontal by the central fissure, from the occipital and temporal incompletely, by the parieto-occipital and Sylvian fissures. The posterior-central convolution is well defined. The parietal fissure in the Orang is more striking than that of man, resembling the Gorilla's; it is twice as long as the corresponding fissure in the Chimpanzee, extending from the transverse occipital fissure, as is sometimes the case in man, almost into the fissure of Rolando. It is unbridged and without a break, and divides the parietal lobe completely into upper and lower parietal lobules. The upper parietal lobule is bounded externally by the parietal fissure; posteriorly it is separated from the occipital lobe, internally by the parieto-

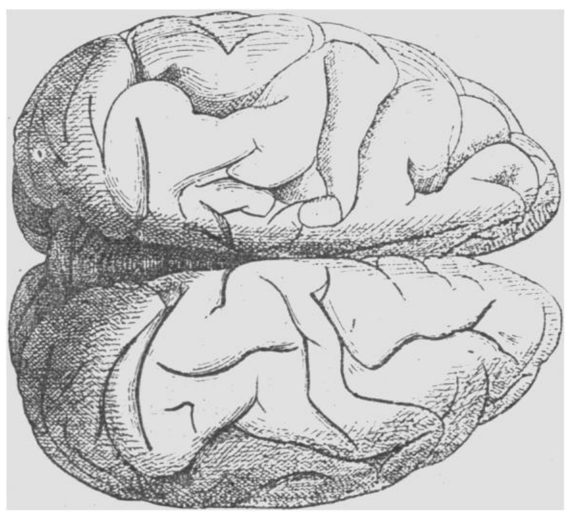

FIG. 2.

occipital fissure; externally it is continuous with the occipital lobe, as the first occipital gyrus, anteriorly it is separated from the posterior central convolution more completely than in man, by a fissure which runs paralled with the central fissure. There is in the Orang, also, a fissure running paralled with the parietal, which subdivides the upper parietal lobule into inner and outer portions. The precuneus, or the space on the mesial side of the parietal lobe between the parieto-occipital fissures and the ascending branches of the calloso-marginal, is well defined. The lower parietal lobule in the Orang divides naturally into the supra-marginal and angular gyri. The supra-marginal fold curves around the upper end of the posterior branch of the fissure ot Sylvius and runs into the superior temporal gyrus. The angular gyrus, which is very evident, arches around the first temporal fissure, and becoming continuous with the second occipital fold, passes then into the upper temporal

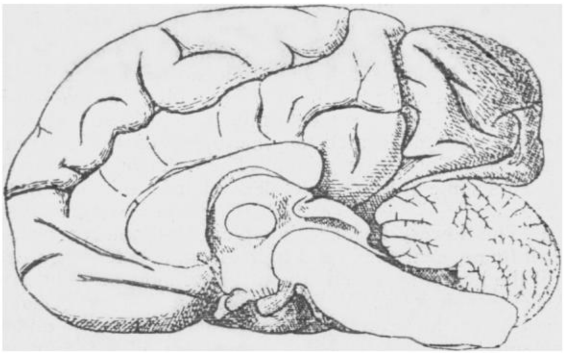

FIG. 3.

gyrus. The occipital lobe, separated from the parietal, internally, by the parieto-occipital fissure, is continuous with the upper parietal lobule through the first occipital gyrus, and by the second occipital gyrus with the angular. There are no sharp lines of demarcation between the occipital and temporal lobes. In the occipital lobe of my Orang the transverse occipital fissure was present, and received the parietal fissure. The calcarine fissure was well marked, but was separated in the Orang from the parieto-occipital fissure by the "deuxième plis de passage interne" of Gratiolet, the "untere innere Scheitelbogen-Windung" of Bischoff. The cuneus of the Orang is therefore somewhat different from that of man. In man I have seen these two fissures separated as an anomaly. The calcarine passed into the hippocampal fissure, so that in the Orang, as in monkeys generally, the gyrus fornicatus was separated from the hippocampal gyrus, whereas in man these convolutions are continuous. This disposition has been noticed in the Hylobates, in Ateles, and in one Chimpanzee, where the calcarine did not reach the hippocampal. The first occipital gyrus is very well developed, and as the late Professor Gratiolet observed, is one of the most striking convolutions

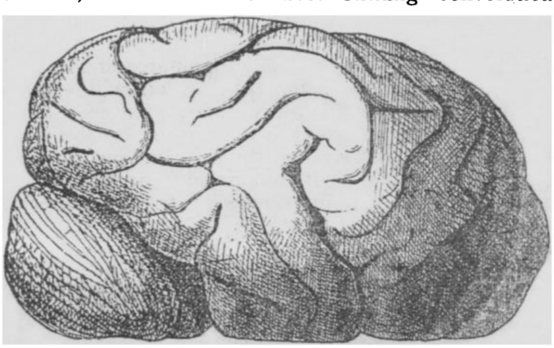

FIG. 4.

in the brain of the Orang. It rises so to the surface that the internal perpendicular fissure or external part of the parieto-occipital fissure is almost entirely bridged over, the operculum so characteristic of the monkey almost disappearing. It is continuous with the upper parietal lobule arching around the parieto-occipital fissure. This convolution comes to the surface in the Hylobates and Ateles almost to the same extent as in the Orang, but it is more developed in the latter than in the Chimpanzee. It is called also the "premier plis de passage externe," by Gratiolet, the "obere innere Scheitelbogen-Windung," by Bischoff, the "first annectant gyrus," by Huxley, and "first bridging convolution," by Turner. The second occipital convolution connects the occipital lobe with the angular gyrus. In my Orang it was partly concealed by the first occipital. It was not as superficial as in man, The third occipital gyrus is continuous with that part of the temporal lobe below the first temporal fissure. I noticed, also, in my Orang the "quatrième plis de passage" of Gratiolet. On the mesial side of the occipital lobe in my Orang was well seen the "deuxième plis de passage interne" of Gratiolet, the "untere innere Scheitelbogen-Windung" of Bischoff, which separates the calcarine from the parieto-occipital fissure; and in both the Orang and Chimpanzee, more especially on the left side, I had no difficulty in recognizing the "premier plis de passage interne" of Gratiolet, its convexity turning inwards, while that of the first occipital gyrus, or the "premier plis de passage externe," turns outward. These two convolutions, the first occipital gyrus and the "premier plis de passage interne," in my Orang were continuous. They are regarded as one by Bischoff, forming his "obere innere Scheitelbogen-Windung," but as two by Gratiolet, constituting his "premier plis de passage externe et interne."

The temporal lobe in the Orang is much less convoluted than in man, or even in the Chimpanzee. The first temporal fissure and first temporal convolution are well marked, but the second and third are badly defined

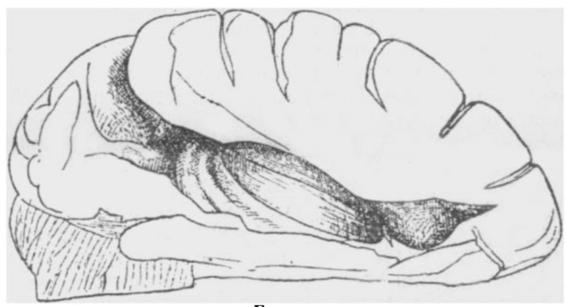

FIG. 5.

The fusiform and lingual lobes are separated by the inferior occipito-temporal fissures, the collateral fissures of Huxley. The Island of Reil was perfectly covered in both the Chimpanzee and the Orang by the operculum, but was not convoluted in my Orang. The surface in places was slightly roughened. I noticed, however, three or four convolutions in the Chimpanzee. On making a section of the left hemisphere of the Orang I noticed that the corpus callosum was relatively smaller than in man, but that the ventricle exhibited an anterior, middle and posterior cornu, the corpus striatum, tænia semicircularis, thalamus opticus and fornix were well developed, the hippocampus major with corpus fimbriatum were perfectly evident, and the hippocampus minor larger relatively than in man. I did not see a trace of the emmenentia collateralis; this is often, however, absent in man.

The cerebellum in my Orang was relatively larger than that of man, but smaller than that of either of the Chimpanzees I have dissected, and was just covered and no more by the posterior lobes of the cerebrum. This relation is still retained in my Orang, though the brain has been lying in alcohol for three months since it was taken out of the chloride of zinc in which it was placed until the pia mater could be removed. During this period it has been subject to the conditions, such as the want of the support of the membranes, the effect of pressure, etc., urged by Gratiolet, Huxley, Rolleston, Marshall, etc., as sufficient to explain why after death the cerebellum is uncovered by the cerebrum in the Orang and Chimpanzee, as held by Owen, Schroder van der Kolk and Vrolik, and Bischoff. Every anatomist knows that the brain, after removal from the skull, especially without the membrane, if left to itself, very soon loses its shape. It is absolutely necessary therefore to examine the brain *in situ*, and after removal from skull to place it in some hardening fluid in which it will float. Even with these precautions, through the change of the surroundings, shrinkage, etc., the brain is always somewhat altered. It happens, however, that I have had lying in alcohol for some years a number of human and monkey brains. Among the latter, examples of the genera *Cebus*, *Ateles*, *Macacus*, *Cynocephalus*, *Cercopithecus*, etc., taken out of the skull sufficiently carefully, but preserved in the rudest manner without any regard to the above precautions. Now, while all of these brains have somewhat lost their natural contour, they are not so changed that in a single one, human or monkey, do I find the cerebellum uncovered by the cerebrum, and in every instance the posterior lobes overlap the cerebellum to a greater extent than I find is the case in my Orang. If the cerebrum and cerebellum in the Orang and Chimpanzee invariably bear the same proportion to each other as they do in man and the monkeys, why should not the brain of an Orang or Chimpanzee, after lying in alcohol for some years, exhibit the cerebellum covered by the cerebrum as in them? Why should it be necessary to replace the brain of the Chimpanzee or the Orang in the skull, to make plaster casts, etc., if there is no difference between their brains and those of man and the monkeys, for there is no necessity of having recourse to such measures to prove that the cerebellum is covered in the latter?

In the account I gave of the female Chimpanzee,[1] I stated that I found the cerebellum uncovered. I had the opportunity a short time since, of verifying that statement in the male, noticing *in situ* that the cerebellum was uncovered by the posterior lobes. This was found to be the case by Mr. Arthur Browne, the Superintendent of the Phila. Zool. Garden, in a third Chimpanzee which died there. With all deference to Prof. Marshall's[2] photograph of a plaster cast of the brain of a Chimpanzee, and however it may truthfully represent the relations of the cerebellum in his specimen, I must say that it would be simply monstrous if accepted as an illustration of either of mine, and with profound respect for Prof. Huxley's[3] opinion regarding the interior of the skull being a guide for the determination of the proportion between posterior lobe and cerebellum, I find it anything but a safe one as regards the anthropoid apes. For the space between posterior lobes of brain and dura mater and bone, both posteriorly and laterally, I find variable *in situ*, due to the state of the blood vessels and amount of fluid in arachnoid and subarachnoid cavities. In speaking of the Gorilla, Prof. Bischoff[4] observes, p. 100, "Das es bei ersterem am wenigsten von oben Hinterlappen der grossen Hemisphäre bedeckt wird und bei der Betrachtung des Schädel gewiss von oben mit seinem hinterem Rande sichtbar wird." And in reference to the Chimpanzee,[5] p. 95, "Die Hinterhauptslappen des grossen Gehirns bei diesem Affen wie bei dem Menschen das kleine Gehirn überzogen und von oben fast ganz bedecken." And Vrolik[6] states, p. 7, of the Orang: "Ce lobe postèrieur ne se prolonge pas autant que chez l'homme; il ne recourve pas si bien le cervelet du moins il ne cache pas complétement surtout vers les côtés." The fact of the cerebellum being covered by the posterior lobes in my Orang and that figured by Gratiolet, and but slightly uncovered in that of Vrolik's, is no more strange than that Bischoff[7] should find it covered in one Hylobates, and Prof. Huxley[8] having stated it to be uncovered in another.

[1] Proceedings of the Acad. Nat. Sciences, Phila., 1879.
[2] Natural History Review, 1861.
[3] Man's Place in Nature, p. 97.
[4] Das Gehirn des Gorillas, 1877.
[5] Gehirn des Chimpanzee, 1871.
[6] Amsterdam Verslagen, Deel, 13, 1862.
[7] Beitrage zur Hylobates, 1860.
[8] Vertebrate Anatomy, p. 411.

CAUSES WHICH DETERMINE THE PROGRESSIVE MOVEMENT OF STORMS.*

PROF. ELIAS LOOMIS.

For the purpose of discovering the causes which determine the progressive movement of storms, I have made an extensive examination of the course and velocity of storm centres in tropical regions, and also of abnormal paths in the middle latitudes of Europe and America. I have examined the courses of all those hurricanes which have originated near the West India Islands, and also all the storm tracks delineated on the maps of the *Monthly Weather Review*. I have examined the courses of all those hurricanes in Southern Asia and its vicinity whose paths have been best determined, and also all the storm tracks delineated on the maps of the International Series of Observation. The following summary presents some of the results derived from this investigation.

1. The lowest latitude in which a cyclone centre has been found near the West India Islands is ten degrees; and the lowest latitude in the neighborhood of Southern Asia is six degrees. Violent squalls and fresh gales of wind have, however, been encountered directly under the equator.

2. The ordinary course of tropical hurricanes is toward the west-northwest. In a few cases they seem to have advanced toward a point a little south of west, and in a few cases their course has been almost exactly toward the north.

3. Tropical hurricanes are invariably accompanied by a violent fall of rain. This rain fall is never less than five inches in twenty-four hours for a portion of the track, and frequently it exceeds ten inches in twenty-four hours.

4. Tropical storms are generally preceded by a northerly wind, and after the passage of the low centre, the wind generally veers to the southeast at stations near the centre, and the southerly wind which follows the low centre is generally stronger than the northerly wind which preceded it. This fact appears to suggest the explanation of the origin of the cyclone, and the direction of its progressive movement. The prevalent direction of the wind in the neighborhood of the West India Islands is from the northeast Occasionally a strong wind sets in from a southerly quarter. The interference of these winds gives rise to a gyration, and a fall of rain sometimes results. When rain begins the latent heat which is liberated causes an inflow of wind from all quarters, by which the rainfall is increased; and since the winds are deflected by the rotation of the earth, an area of low pressure is produced, and the force of the winds will be maintained as long as the rainfall continues. The effect of this strong wind from the south is to transport the low centre in a northerly direction; and by the combined action of this south wind and the normal wind from the northeast the centre of low pressure is usually carried in a direction between the north and west.

The electrical blowpipe of M. Jamin consists of a pair of carbon pencils—an electric candle, in fact—surrounded by a coil of insulated copper wire wound a few inches distant from the pencils in the plane of their axes. The current is so led that, in circulating round the coil, it will attract the electric arc formed at the lower end of the carbon pencils, and cause it to flash out almost in the form of a fish-tail gas flame. This spreading out of the arc is the special feature of the action of the apparatus. It facilities the application of the heat of the electric arc to the fusion of refractory substances, and enables us better to take advantage of this little-used means of producing a very high temperature.

* Read before the A. A. A. S., Boston, 1880.