

variations synchronous with those of the Arctic.

The general conclusions are that in the Arctic the eighteenth century was a period of very marked advance of the glaciers, that this was preceded by several centuries of great retreat, and followed by a small retreat which is still in progress. Where the information is sufficient these conclusions are fully established; where it is meager they are partially confirmed or at least not contradicted.

M. Rabot points out certain resemblances and differences between the variations of the arctic glaciers and those of the Alps. Although, so far as can be made out, there seems to be a fair accord in the dates of the variations, there seems little relation between their respective intensities. The general advance of the arctic glaciers in the eighteenth century was not marked in the Alps; and the strong retreat of the second half of the eighteenth century in the Alps is but faintly shown in the Arctic. Moreover, it has not been possible to show a distinct relation between the variations of climate and the variations of the glaciers in the Arctic as has been done in the Alps.

M. Rabot has accomplished what must have been a laborious task, and deserves the thanks of all persons interested in the variations of glaciers.

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The Brain of 'Acipenser. A Contribution to the Morphology of the Vertebrate Brain. By J. B. JOHNSTON, Professor of Zoology, West Virginia University. Zool. Jahrb., Abt. f. Anatomie, Bd. XV., Jena, 1901, pp. 204, with 12 plates and 22 text-figures.

The application of the cell theory to the nervous system (for this is what the doctrine of the neurone amounts to in the upshot) has reached its consummation only within the past decade. Accordingly, the neurology of to-day, whether human or comparative, demands not merely topographic descriptions of the tracts and nuclei within the brain, but the precise relations between the two, stated anatomically in terms of cellular morphology as well as in terms of experimental pathology. This necessi-

tates the rewriting of some chapters in the standard text-books and the repetition of many classical researches upon the lower animals with 'modern neurological methods.'

Such, then, is the motive which has led Professor Johnston to attempt 'a complete study by modern methods of the brain of a lower vertebrate.' The type chosen, the sturgeon, was described in 1888 by Goronowitsch, and the present study aims to fill in the cellular details upon the basis of the topography as there laid down (with the result, we may add parenthetically, of correcting several errors both of fact and of morphological interpretation found in Goronowitsch's account). Standard histological methods—among which judicious staining with Delafield's hæmatoxylin is still unrivaled for lower brains—were, accordingly, supplemented by the use of methylene blue in various forms and by chrome silver impregnation. The author's results with the latter method are especially brilliant. He has succeeded in getting whole brains impregnated and cut into unbroken series of sections, so that the courses of the more important tracts could be controlled by the actual demonstration of the paths of individual fibers through them.

Of the 12 plates accompanying the paper, one is a chart showing all the more important fiber tracts in the brain of this fish elucidated by an ingenious color scheme, the reflex arc being represented as consisting of a chain of several links which are indicated by colors of the spectrum, sensory roots blue and motor roots red, with the connecting tracts in series between. The other plates (all photographic reproductions from untouched negatives) include seven views of the entire brain, 56 photographs of Golgi preparations, illustrating nearly all the important types of neurones in the brain, and 21 transverse sections from a series stained with Delafield's hæmatoxylin to illustrate the topography. The latter are accompanied by lettered outline drawings on transparent paper and incorporate also some results of the study of Golgi sections.

Dr. Johnston is one of the few neurologists who give evidence of an adequate appreciation of the importance of the peripheral nervous system as furnishing the key to the central, and

who accordingly have fully and sympathetically entered into the doctrine of nerve components as developed within the past decade. While he has not himself studied the peripheral nervous system of *Acipenser*, his analysis of the medulla oblongata has been made in the light of the facts of peripheral connections already known, and hence his results are of far-reaching importance to the major problems of the morphology of this confusing region. Into the details of these results we cannot now go, merely calling attention to the fact that in this connection he has made some observations of great importance to the phylogeny and organogeny of the vertebrate nervous system.

For instance, he confirms statements of previous writers that the communis, or visceral sensory, system of cranial nerves is related anatomically with centers both in the oblongata and in the spinal cord which are quite distinct from those of the tactile nerves (general cutaneous centers and dorsal horns). On the other hand, the acustico-lateral system of cranial nerves, innervating the ear and lateral line organs, is structurally very intimately related to the general cutaneous centers and dorsal horns. Johnston, in agreement with other very recent writers, finds the cerebellum directly related with the tuberculum acusticum, all the types of cells characteristic of the cerebellum being represented in the acusticum by transitional forms. From this it follows that the cerebellum and acustico-lateral nerve centers are phylogenetically derived from the dorsal horns of the spinal cord. It is important that this interesting conclusion be controlled by studies upon still more primitive vertebrates and by embryological studies upon the lower fishes, and that the succeeding steps in this evolutionary process be worked out in the types next above the ganoids. The first of these desiderata has already been met in large measure by an exhaustive study of the brain of the lamprey by similar methods, which Dr. Johnston has now in press in an American journal and by which the main theoretical conclusions of this paper are confirmed in a striking manner.

Another critical region upon which interesting conclusions are expressed is the pallium.

"There are found in *Acipenser* two sets of cells which seem to constitute the earliest representative of the cortex proper. One of these serves to connect the epistriata of the two sides by fibers through the anterior commissure. The other is found in the dorsal membranous roof of the fore-brain and probably corresponds to the dorsal or dorso-median cortex of reptiles. The transformation of a membranous pallium into a massive nervous pallium, which has recently been declared impossible, is seen in actual progress in its early stages in *Acipenser*."

In conclusion, we may add that, whether Dr. Johnston's theoretical conclusions stand or fall (and we think that for the most part they will stand), the cause of sound morphology is best promoted by just such exhaustive and painstaking researches as this one, by which a secure basis of positive fact is first laid down.

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The Smithsonian Institution, Documents Relative to its Origin and History, 1835-1899. Compiled and edited by WILLIAM JONES RHEES. In two volumes. Vol. I., 1835-1887. Twenty-fourth Congress to Forty-ninth Congress. Washington, Government Printing Office. 1901. Pp. liii + 1044.

The Smithsonian Institution is taking praiseworthy pains to make permanent records of its origin, history and activities, so that the future historian of science in America shall be able to draw from authorized sources. Three volumes have previously appeared pertaining to the origin and history of Smithsonian's foundation, one bearing a title similar to that under review, one dealing with the 'Journals of the Board of Regents, Reports of Committees, Statistics,' and the third, the large, handsome work, 'History of the First Half Century,' edited by Dr. George Brown Goode and published in 1897. The volume in hand is compiled and edited by one who has been in the service of the Institution under all three secretaries, as chief clerk and now as keeper of archives, and whose familiarity with the life of the Smithsonian, together with painstaking research, has produced a valuable work.

The book is complementary to that issued in 1879, and contains in detail the history of the