

development of two and three sets respectively, coming to maturity on consecutive days. This hypothesis, of course, cannot apply to the tertian type of malarious fever, since in this the febrile paroxysms follow each other with an interval of only one day of apyrexia intervening, instead of two days as in the case of the quartan type.

Golgi is of the opinion that he has brought forward satisfactory evidence to show that tertian ague depends on the presence in the blood of a distinct variety of the malaria parasite, which passes through its developmental phases in two days instead of in three. In regard to classification, Golgi holds that the various clinical types of intermittent fever are caused by varieties of one and the same parasitic species, and that this belongs to the genus *amoeba*. The twelve photographs which illustrate his first paper deal with the development of the parasite of quartan fever, and show, surrounded by normal red blood corpuscles, its successive metamorphoses. The photographs, which are very fine, were taken by means of Zeiss's microphotographic apparatus.

LETTERS TO THE EDITOR.

On some Extinct Vertebrata from the Miocene Rocks of the North-west Territories of Canada recently described by Professor Cope.

AMONG the more recent and interesting additions to the collections in the National Museum, Ottawa, Canada, are the mammalian and fish remains from the tertiary rocks of the Canadian North-west. These collections which were made by Messrs. McConnell and Weston especially have been recently studied by Professor E. D. Cope of the Academy of Natural Sciences, Philadelphia. The results of his observations will soon be made known in a memoir now in print, and to be published by the Geological Survey Department. The specimens in question are now on exhibition in the upright cases of the museum, and from the labels attached the following interesting forms are noticed as of special interest.

Extinct Rhinoceros (Menodus angustigenis). — This is the name which Professor Cope has given to the largest species of hoofed animal analogous to the rhinoceros that has ever yet been discovered, and which in early tertiary times was roaming in the then existing forests of the now treeless prairie regions of Canada.

The best portion of the skull of one individual may be seen, about three feet long and eighteen inches across, with the frontal bones and snout preserved; also the two horn-cores and portions of the upper jaw, with several huge molars *in situ*. The lower jaw of the same individual was also found, and the teeth beautifully preserved. Some of these teeth are nearly four inches across and three inches in thickness, being nearly four inches in length, with zig-zag and sharply-cut crowns. The humerus, femur, tibia, many horn-cores, and bones of the pelvic arch and of various other portions of the skeleton, were also found, making in all a beautiful display of fossil bones belonging to as huge and ferocious a beast as prowls to-day in the jungles of an African or Indian forest. Besides this form of *Menodus*, Professor Cope has recognized a number of others, to which he has given separate specific designations, so we find that there existed in Canada not only this huge and ferocious species of *Menodus*, but other allied creatures. These include *Menodus syceras* Cope, *M. Proutii* Owen, *M. Americanus* Cope, and *M. Selwyni* Cope. They all belong to miocene tertiary strata occurring in the vicinity of Swift Current Creek, North-west Territory. These all belong to the family of the *Titanotheriidae*, and form a group of animals analogous to the rhinoceros.

Extinct Horse (Anchitherium Westoni) Cope. — This is one of the forms which belong to the *Palæotheriidae*, a family of extinct animals whose affinities seem to place them foremost as the ancestors of the *Equidae* or horses.

Extinct Boar (Elotherium Mortoni) Leidy. — Among the specimens on exhibition and collected by Mr. Weston may be seen an almost perfect lower left ramus of this extinct mammal, allied to the modern wild boar and pig, and belonging to the family of the *Chaeropotamidae*. This creature was of huge dimensions, the specimen of the jaw in question being nearly ten inches in length.

The teeth are beautifully preserved in a spotted grey and yellow-white lime-rock. This is the first time that this form has been found so far north on the American continent.

Extinct Deer (Leptomeryx mammifer) Cope. — This new species, a member of the family of the *Tragulidae*, appears to be one of the ancestors of the deer tribe, being both a ruminant and ungulate mammal. A very well preserved portion of the lower jaw, with several teeth *in situ*, has permitted Professor Cope to establish its relations and affinities, and it forms a valuable addition to the fauna of those times which preceded the advent of the great ice age, when all these types disappeared and made room for the mastodon, the mammoth, and other creatures, including the megalonyx and its allies.

Other Extinct Forms. — Besides the above may be seen a large incisor belonging to a large *carnivore* allied to the modern dog or wolf; the tooth of an oreodont, an extinct hare (*Palæolagus turgidus* Cope) belonging to the family of the *Leporidae*; also a species of *Trionyx* which Professor Cope has called *Trionyx leucopotamicus*, from the fact that similar forms occur also in the White River series of formations in the southern territories of the United States. But besides the above we find also extinct forms allied to the squirrels (*Hypertragulus riversus* Cope), and also a large number of bones of siluroid fishes belonging to the genera *Amiurus*, *Rhineastes*, etc. Among these we find *Amiurus McConnelli*, *A. cancellatus* (all described by Cope); also *Amia macrospondyla*, *Amia Selwyniana*, and *Rhineastes rhœas* Cope.

Fossil Turtles. — Then come the remains of a species of *Stylomys*, an extinct turtle belonging to the family of the *Testudinidae*, one of the *Chelonina*.

Chalicotherium and *Hempisalodon*. — The latter form (described under the name of *H. grandis* Cope) affords another example of an extinct type of hyena, much larger than any of the modern living ones. It belongs to the family of the *Hyænodontidae*, and forms a part of a sub-order of that family with very large representatives. The genus *Chalicotherium*, one of the family of the *Chalicotheriidae* Lydekker, has certain affinities to the rhinoceros, whose size and proportions it greatly resembled.

Thus it will be seen that from the miocene tertiary strata of the Swift Current River, not far from the line of the Canadian Pacific Railway, along the treeless prairie region of Canada, a large fauna existed, some of whose remains now adorn the cases of the National Museum at Ottawa.

HENRY M. AMI.

Ottawa, Ont., July 6.

Osteological Notes.

AMONG the primates, the *Anthropomorpha* (higher apes) have strong jugal arches, longer than in man, and presenting marked horizontal and vertical curvature. Although properly composed of only two bones, viz., the zygomatic process of the squamosal, and the jugal, this last rests upon a process of the maxilla so much developed that in many cases it might be rightfully considered as entering into the formation of the arch. The suture which joins the squamosal and the jugal is long and serrated, its great inclination downwards and backwards vastly increasing the strength of the parts as well as the power of resistance.

In the gorilla the jugal arch is relatively broader and more developed than in the other higher apes. The process of the squamosal presents a sudden vertical convexity upon its upper border, at a point corresponding to the junction of the anterior transverse root, the remaining portion of the arch being nearly of the same width. The breadth of the channel for the play of the temporal muscle is proportionally large. The entire structure of the arch, especially in its horizontal and vertical curvatures, exhibits enormous strength. In the adult male all the cranial ridges attain their maximum size, thus presenting a largely increased surface for the origin of the temporal muscle, while the relative greater breadth of the ascending ramus of the mandible, and the increased width of the pterygoid fossæ are correlated with a corresponding development of the masseter and pterygoid. The long and massive canines so characteristic of the higher apes, especially of the gorilla and orang, have reference to the powerful action of the last-named muscles. Their use has also a sexual relation. The glenoid cavity is transversely broader than in man, and

more shallow, its anterior boundary, formed by the inferior root of the zygoma, being scarcely developed, allowing greater freedom for the antero-posterior movement of the articulation of the mandible.

In comparing the skull of the male gorilla with that of man, — a male negro, for example, — we shall find the jugal arch of the former to be built upon a vastly stronger plan, both the squamosal and the malar presenting different forms and proportions. The squamosal is as long and vertically as wide as the malar portion of the arch, while its upper border rises into an angular form, constituting a very marked convexity, no trace of which is to be seen in the negro. In the latter the jugal portion of the arch decreases in depth after leaving the body of the bone, whereas in the gorilla it continues of the same depth and is also longer.

In the orang, the horizontal curvature of the arch is greatly produced, and strongly developed at the portion corresponding to the malar-squamosal suture. Its inferior border is flattened and thickened. The vertical curvature, however, is not so great, while the channel for the temporal muscle is relatively wider than it is in the gorilla. The crests and ridges of the cranium, especially in the male, express the great energy of this muscle, although the general outline of the arch is far less massive than in the latter ape.

The jugal arch of the chimpanzee's cranium presents much resemblance to that of man, being narrow, and with slight curvature either horizontal or vertical. The malar is anteriorly flatter,

and its orbital process is longer and narrower at its base. The extent of surface for the development of the temporal muscle is greater than in man, and the width of the channel relatively increased.

The slight modifications observed in the jugal arch of the gibbons (*Hylobates*) exhibit a distinct tendency to those shown in the lower type of the *Simiana*, the monkeys. In these last, the old-world monkeys (*Catarrhinae*), the arch takes on a sigmoidal curvature, thus presenting upon its superior border a slight convexity behind and a corresponding concavity anteriorly. The extent of this curvature varies in different groups. In the new-world monkey (*Platarrhinae*) the post glenoid process of the squamosal is largely increased, while the remarkable extent of the ascending portion of the ramus, both vertical and antero-posterior, has reference to the great development of the vocal organs in the howling monkeys (*Myctes*) rather than to any unusual energy of the masticatory muscles.

In the *Lemuroidea*, the family of the common lemurs (*Lemurinae*) have an arch which in most cases is nearly straight, narrow, long, and distinguished by a malar-squamosal suture which is almost horizontal in direction, the amount of the overlapping of the jugal by the lengthened process of the squamosal being exceptional, while in some cases the jugal is partially underlapped by a process from the maxillary.

In studying the significance of the jugal arch as presented in the primates, although the modifications exhibited in some groups

Publications received at Editor's Office,
July 15-21.

- BRENTARI O. Guida del Trentino. (Società degli Alpinisti Tridentini XV. Annuario.) Bassano, Premiato Stabil. Tipogr. 459 p. 16°.
- CARHART, H. A. Primary Batteries. Boston, Allyn and Bacon. 193 p. 12°. \$1.50.
- DRAYTON, H. S. Vacation Time, with Hints on Summer Living. New York, Fowler & Wells Co. 84 p. 12°. 25 cents.
- GUYAU, J. M. Education and Heredity. (Contemporary Science Series.) New York, Scribner's. 306 p. 12°. \$1.25.
- MARILAU, A. K. v. Allgemeine Naturkunde. Lief. 124-129. Pflanzenleben, II. heft. 7-12. Leipzig, Bibliog. Institute. 336 p. 4°. (New York, Westermann.)
- MERCANTILE Journal, the. Vol. I., No. 1. w. Chicago, J. A. Brewer & Co. 8 p. 7°. \$3 a year.
- PILSBRY, H. A. Sea Shells of the Jersey Shore. Asbury Park, N. J., A. P. Novelty Co. 40 p. 16°.
- ROYAL Society of Canada. Proceedings and Transactions of the, for the year 1890. Vol. VIII. Montreal, Dawson Bros. 632 p. 4°.

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of the order cannot readily be explained, the principal laws which govern its morphology, and which have been noted in previous papers, are sufficiently evident. These are, that the development of the arch, as shown by the number of bones, by the degree and form of its curvature, by its relation to the orbit and articulation of the mandible, as well as to other neighboring parts, and the amount of surface presented for muscular development, are correlated with the energy of the masticatory power, joined in some of the higher apes with a prehensile strength of jaws and dental series eminently characteristic of their ferocity.

D. D. SLADE.

Cambridge, Mass., July 11.

AMONG THE PUBLISHERS.

THE J. B. Lippincott Company, Philadelphia, have in press, and will publish early in the fall, "A Supplement to Allibone's Critical Dictionary of English Literature and British and American

Authors," by John Foster Kirk. The work contains over thirty-seven thousand articles (authors), and enumerates over ninety-three thousand titles. It will be published in two volumes, large 8vo size, and will comprise about sixteen hundred pages.

— *The Chautauquan* for August presents the following among other articles: "Flying by Means of Electricity," by Professor John Trowbridge; "What Shall be Taxed?" by Edward W. Bemis; "African Myths and Legends," by Heli Chatelain; "The Physical and the Mental in Hypnotism," by Alfred Fouillée; "Death Valley," by R. S. Dix; "Travelling in Provincial France," by Elizabeth Robins Pennell; "England in the Eighteenth Century," by Edward A. Freeman; "The Spell of the Past," by John Burroughs; "Modern Surgery," by C. R. Hammerton; "The Sorosis Club at Bombay, India," by Mrs. M. B. Denning; "A Colored Creole Type," by Julie Wetherill Baker; "What Women's Clubs have done for Women," by Mrs. Kate Tannatt Woods; and "A Town Minus Poverty," by Clare De Graffenried.

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