latitude were respectively 25° south of east and west: while a third series of ornaments faced the full midday sun. Others were similarly arranged for the summer solstice; and a great stone over the temple showed, by alignment with the main altar and a carved pattern on the wall, the true north and south.

Last year an English archæologist undertook a journey to Greece to make a special study of the orientation of the ancient temples on that classic ground, but his results have not yet appeared. Certainly, as will be seen from the above, the point is one full of significance.

On Prosopology.

There is little doubt that craniology, as a branch of anthropology, has been much over-estimated, and affords only very insecure material for ethnic classifications. On the other hand, the study of the features of the face, which may be called Prosopology, from the Greek, *prosopon*, face, is yielding constantly more valuable results. The width or narrowness of the face, the nasal and orbital indices, the prominence of the jaws, the facial angles, and the development of the chin, all are points of prime ethnic significance.

One of the leading European writers on this subject is Professor Kohlman of Basel, whose works are extremely instructive. In this country a series of papers on "The Ethnology of the Face," by Dr. A. H. Thompson, have appeared in the *Dental Cosmos* for the current year. They place the details of the subject in a popular light, and emphasize its value; but they would be more satisfactory had their author not been led astray by some of the books which he quotes. To class the Eskimos and the American Indians among the Mongolians is quite out of date; and to call the white race Caucasians, and to divide them into blondes and brunettes as leading subdivisions is scarcely less so. He does, indeed, distinguish an "Americanoid" type, from which he excludes the Eskimos and Aleuts as being "true Mongols;" on what grounds he or any one would be puzzled to say. He describes the hair of this "Americanoid" type as similar to that of the Mongolians, from which, in fact, it differs in nearly every respect. In spite of these drawbacks, Dr. Thompson's articles form a welcome and praiseworthy addition to recent American contributions to anthropologic literature.

Linguistic Bibliography.

The study of American languages will in the future be vastly facilitated by the admirable series of bibliographies by Mr. James C. Pilling, which are now being published by the Bureau of Ethnology. Some idea of their thoroughness may be gained from the fact that the latest issued, confined to the Algonquian dialects alone, has 614 double-columned, closely printed, large octavo pages! Compare this with the 258 pages of Ludewig's "Bibliography of American Aboriginal Literature," which included all the languages of both North and South America!

Mr. Pilling has put forth similar volumes, less in size but not inferior in completeness, on the Iroquois, Eskimo, Dakota and Muskokee groups of tongues; and proposes to lay a similar basis for the study of all the North American stocks. It would be most desirable for some similar catalogue to be made relating to the tongues of South America.

The Decrease of the Birth-rate.

One of the most portentous problems is the decrease of the birth-rate in certain social conditions. It is asserted on apparently good authority that the Negritos and the Polynesians are dying out, largely owing to the infertility of their marriages. Certain South American tribes, the Guatos of Paraguay, for instance, will soon disappear from the same cause. But we need not confine our instances to savage peoples. Physicians say that our "colonial dames," scions of Anglo-American families who have lived several generations in this country, have much smaller families than their great-grandmothers.

In France this lessening of the birth-rate has assumed serious proportions, and has alarmed patriotic men lest as a nation it should become numerically too weak to hold its own in the conflicts of the future. The distinguished author and statesman, the Marquis de Nadaillac, has published some stirring admonitions to his countrymen on the subject under the titles "Le Peril National and la Depopulation de la France." He finds the birth-rate least in the cities, in the richest communes, and in the most prosperous conditions of society. Turning to its causes, he has convinced himself that this diminution is voluntary and of malice prepense on the part of married couples. They do not want the bother of many children; they do not wish their property to be split up; they prefer pleasure and ease to the labor of parental duties. Young men prefer mistresses to wives, and mistresses are always barren. The competition of modern life and its rabid thirst for enjoyment undermine the family tie. The birth-rate is small, not for physiological but for sociological reasons. How far this applies to the United States has not yet been sufficiently investigated; but it is probably nearly equally true here.

THE VARIABILITY OF SPECIFIC CHARACTERS AS EXHIBITED BY THE EXTINCT GENUS CORYPHODON.

BY CHARLES EARLE.

IT is a well-recognized law in biology, that a species or a genus upon the point of extinction undergoes a great amount of variation; and, as an example of this kind, I propose to describe some of the variations which the species of the fossil genus *Coryphodon* exhibit.

The fine collection of Coryphodon material in the American Museum of Natural History has enabled me to study this subject; and in a forthcoming paper in the Bulletin of the Museum I shall attempt a revision of the American species of *Coryphodon*.

The great amount of variation in this genus is shown from the fact that no less than twenty-one species have been described, and only in a few cases have any of them been acknowledged as synonyms.

Taking up the variation of the teeth, I will first describe the structure of a typical upper and lower molar of *Coryphodon*. The superior molars are a modification of the primitive tri-tubercular type, in which the anterior crescent, or antero-external lobe, has been lost, or so much modified that only traces of it remain. On the antero external portion of the crown there is a prominent cone, which is in connection with the single internal lobe by a sharp crest (see Fig. *a*, *c*); this forms the main grinding surface of the tooth. On the second superior molar of a true Coryphodon there is always a well-developed postero-external crescent (see Fig. *e*, *c*), which is homologous with the postero-external crescent of other forms. This crescent may undergo a great amount of variation, as will be described later. In the last superior molar the postero-external crescent is represented by only a crest, which runs parallel, or nearly so,

with the anterior crest already described. As in all the early Eocene-Tertiary Mammalia, the pumolars of both the lower and upper series are much simpler than the true molars. The structure of the lower molars of *Coryphodon* is interesting, as it represents a stage in the modification of a more primitive type, which had the enamel arranged in the form of two symmetrical V's or crescents. Now in *Coryphodon* the anterior limb of each crescent is nearly reduced; this applies especially to the posterior V. The portion of the tooth bearing the anterior V is raised high above the posterior or heel part.

The variation in size of the teeth of the different species of *Coryphodon* is very great, and in not a single instance have I been able to find two individuals, of the same species, whose teeth are of the same size. This variation is shown in the form of the canines and incisor teeth; in the former the difference in size is largely due to age and sex.

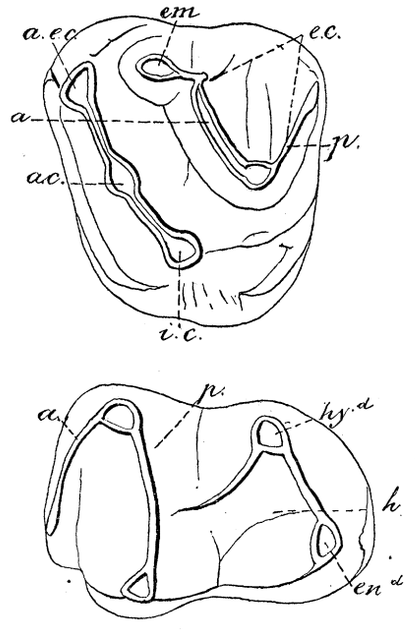
The last upper molar undergoes a great amount of variation, it varying from the nearly quadrate form to that of an elongated oval, the latter form occurring in the more modified species. The modification of the elements of the crown of the second superior molar is interesting, as we can trace in this transformation a true phyletic series, from the less specialized to the more modified species. The typical forms of *Coryphodon* have the external crescent of this tooth well developed. The first step towards reduction of the crescent occurs where the intermediate portion of the posterior limb (see upper Fig. *p*) disappears, leaving an external isolated cusp (*C. testis*). This condition is found permanent on the last superior molar of *Ectacodon*, the latter genus not having advanced so far in its dental evolution as *Coryphodon*. The species *C. elephantopus* represents an intermediate stage in its dental evolution between that of *Coryphodon testis* and *Ectacodon*.

Professor Cope established the genus *Metalophodon* upon the character of the crescent of the second superior molar, and in this genus the posterior limb of the crescent is nearly reduced. As all stages exist in which this crescent is well developed down to that where it is wanting, I can not accept Metalophodon as a good genus, and believe it should be considered a synonym of *Coryphodon*. The most modified condition of this crescent is where it is reduced to merely the anterior limb. The latter stage is permanent in the last upper molar of all the known species of *Coryphodon;* but it is interesting to note that in a genus described by Cope, called *Manteodon*, the last upper molar has a perfectly formed external crescent.

The genus *Manteodon* differs from all other genera of the *Coryphodontidæ* from the fact that the last upper molar has two well-developed internal cones. Now in all other forms of this family the postero-internal cone (*hypocone*) is wanting, although traces of it occur in *C. elephantopus*.

It is not without considerable difficulty that the homologies of some of the elements of the upper molars of *Coryphodon* are determined. The form of molar from which the *Coryphodon* type of tooth has probably arisen, occurs in the genus *Pantolambda*, which is from the Puerco or lowest Eocene beds of New Mexico. In *Pantolambda* both the external crescents of the superior molars are well developed, and the internal cone has two crests running out from it. Now what are the homologies of the anterior portion of the *Coryphodon* molar as compared with that of *Pantolambda*. The postero-external crescent is equally well developed in both forms, but what has become of the anterior crescent in *Coryphodon*, which is so strongly developed in *Pantolambda*? The prominent cusp (see Fig. *e.m.*) on the external face of all the superior molars of *Coryphodon* probably represents the reduced anterior crescent of *Pantolambda*. This is the homology advanced by Professor Cope. The anterior crest of *Coryphodon* has arisen by the development of the crest running outwards from the internal cone of *Pantolambda*. Thus it is by studying the earlier or more primitive types of many of the Mammalian phyla that we are enabled to interpret those marvellous changes which different parts of the dental and skeletal structures have undergone.

The structure of the last lower molar displays considerable variation; this affects particularly the elements of the heel (see lower Fig. *h.*). In the more primitive species the two cusps forming the heel are in a straight line, whereas in other varieties a small cusp may arise in the posterior valley of the heel, internal to the postero-internal cusps (*e, n, a*). The growth of this rudimentary cusp causes the pushing outwards of the



A superior and inferior molar of a typical species of Coryphodon (C. radians). *a. e. c.*, antero-external cone; *a. c.*, anterior crest; *i. c.*, internal cone; *e. m.*, external median cusp; *e. c.*, postero-external crescent; *a.*, anterior limb of crescent; *p.*, posterior limb; *h.*, heel of lower molar; *hy.d.*, external cone of heel; *en.d.*, internal cone.

internal of the two primitive cusps forming the heel; further growth causes the primitive internal cusp to occupy a median position, and it now fulfils the function of a fifth lobe of some of the other Ungulates. This postero-median cusp is merely an analogical structure, and its development proves that it is not homologous with the fifth lobe of the Lophiodonts.

The skeletal variations are many in this group, they affect principally the length and heaviness of the limb bones, and also the size of their articular extremities may vary a great deal.

The variations of the astragalus are particularly interesting, as upon them in some cases new genera have been established. A very primitive structure occurs in the tarsus of *Coryphodon*, as in all the other genera of the *Amblypoda;* that is, on the inner side of the astragalus, a separate bone, or rather a facet for this bone to articulate with, is present. The bone articulating with this facet is generally called the tibiale or internal navicular. Baur[1] has shown that the

[1] American Naturalist, January, 1885, p. 87.

tibiale occurs in the tarsus of the recent genera *Cercolabes* and *Erethizon* as it does in that of *Coryphodon;* therefore the presence of this bone must be considered as one of the primitive characters of the skeleton of this extinct group of Ungulates.

The relations of the tibiale facet to the other facets of the astragalus may vary a good deal, and in many cases the tibiale facet appears to be absent, whereas it is really not separated from the navicular facet of the astragalus.

In conclusion, I wish to add that I was led to write this abstract in order to show the numerous variations of the species of *Coryphodon*, and that in this group it is exceedingly difficult to say where one species ends and another begins. In most cases the characters run into each other so insensibly that it is almost impossible to separate the species. However, I believe there are about eight good species of *Coryphodon* whose characters show a progression from the primitive to the more specialized types; this progression and specialization affecting the teeth more particularly, as already described.

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INDIAN NUMERALS.

BY EDWARD F. WILSON.

IN an essay on "The Origin of Languages," published several years ago by Mr. Hale, the idea is suggested that, as, for example, among our native Indians a family may, while hunting or in time of warfare, have chanced to become separated entirely from the rest of the tribe, father, mother, and elder members of the family may all have perished, and two or three little children have been left alone. Such children, Mr. Hale thinks, would gradually invent a new language of their own, retaining, perhaps, a few words or parts of words of their mother tongue. In this manner, he thinks, may be accounted for the remarkable diversity of tongues among the Indians of the Pacific coast, where among the mountains and forests a family might thus easily become isolated, and the comparative oneness of speech on the great central plains of this continent and in such an open country as Australia.

If there is any good foundation for such a theory as the above, we should expect that the old words retained by these young founders of new varieties of speech would be words of the simplest character and those most often in use in the domestic circle. And, indeed, I think we do find that fire, water, I, you, one, two, three, four, five are the words that generally approach the nearest to one another in a comparison of the different vocabularies.

The North American Indians, as a general rule, count by the decimal system, as do most civilized peoples; but it is noticeable that, after giving a distinct name to each figure from one to five, they, in many of the dialects, seem to commence anew with the figure six, the first part of that numeral sometimes being a contraction, or other form, of the numeral one, and the latter part of the word seeming to point on towards ten. Thus, in the Ojebway we have (1) pejig, (2) nij, (3) niswi, (4) niwin, (5) nanăn, (6) ningodwaswi, (7) nijwaswi, (8) nishwaswi, (9) shangaswi, (10) midaswi. It will be noticed here that from six to ten inclusive the termination is *aswi*. *Ningo*, with which six begins, is another form of pejig (1) never used alone, but only in composition, thus: ningo-gijik, one day; ningo-tibaiigan, one measure. In the Cree language (another Algonkin dialect) the first ten numerals are as follows: (1) peyăk, (2) niso, (3) nisto, (4) né·o, (5) niya'năn, (6) nikotwasik, (7) tepakŭp, (8) ayena'new, (9) keka mita'tat, (10) mita'tat. Here it will be noticed that these Cree numerals resemble those of the Ojebways from one to six, but with seven they branch out into distinct words; then with ten they come together again, mita'tat not being dissimilar to midas'wi, and still more like midatching, the Ojebway equivalent for "ten times." Neither is the Cree numeral for nine so unlike that of the Ojebways as might at first sight appear. Keka mita'tat means "nearly ten," and this suggests that the Ojebway word shangaswi may mean the same, chegaiy or chig' being the Ojebway for near.

The reason for the decimal system being so prevalent all over the world, both among civilized and barbarous people, is doubtless the fact that human beings are possessors of ten fingers, five on each hand. The common manner of counting among the Indians is to turn down the little finger of the left hand for one, the next finger in order for two, the next for three, the next for four, and the thumb for five; then the thumb of the right hand for six, and so on until the little finger of the right hand is turned down for ten. In indicating numbers to others, the left hand held up with all the fingers turned down except the little finger would mean one; that and the next finger to it held up would mean two and so on. In counting by tens they will close the fingers of each hand to indicate each ten, or they will hold both hands up with the palms outward and fingers extended for each ten.

Some Indian tribes in counting resort to their toes as well as their fingers, and thus follow the vigesimal system. The Indians of Guiana, it is said, call five a hand, ten two hands, and twenty a man.

The Dakotas have a peculiar system of their own. When they have gone over the fingers and thumbs of both hands, one finger is temporarily turned down for *one ten*. At the end of the next ten another finger is turned, and so on to a hundred. Opawinge, one hundred, is derived from pawinga, to go around in circles, to make gyrations.

Indians are not generally good arithmeticians. In their native state they have no idea of making even the simplest mental calculation. To add or subtract they will use sticks, pebbles, or other such objects.

To illustrate the manner in which various tribes (some of them of different stocks) count from ten upwards, examples are herewith given from the Ojebway, Blackfoot, Micmac, and Dakota languages: With the Ojebways 10 is midaswi; 11, 12 are midaswi ashi pejig, midaswi ashi nij; 20, 30 are nij tana, nisimidana; 21, nij-tana ashi pejig; 100, ningodwak; 101, ningodwak ashi pejig. With the Blackfeet 10 is kepo; 11, 12, kepo nitsiko'poto; 20, 30, natsippo, niippo; 100, kepippo. With the Micmacs 10 is mtŭln; 11, 12, mtŭln tcel na-ukt, mtŭln tcel tabu; 20, 30 are tabu inskääk, nasinskääk; 21, tabu inskääk tcel na-ukt; 100, kŭskimtŭlnakŭn; 101, kuskimtŭlnakŭn tcel na-ukt. With the Dakotas (or Sioux) 10 is wiktcemna; 11, 12, wiktcemna sanpa wanjidan (10 more one), wiktcemna sanpa nonpa; 20, 30 are wiktcemna nonpa (ten two), wiktcemna yamni; 21, wiktcemna nonpa sanpa wanjidan (ten two more one); 100 is opawinge, meaning a circle.

In some of the Indian languages there is more than one set of the cardinal numbers. Animate objects may be counted with one set, inanimate with another. They may have a particular set for counting fish or for counting skins; perhaps a set for counting standing objects, and another set for counting sitting objects, etc.