Professor Hall evidently considers it better to deal with a small number of well-characterized species instead of a large number of ill-defined forms, and that such minor structural internal modifications as can be shown to be constant in a recognized geological horizon should be raised to generic or sub-generic rank. The description and portrayal of such generic divergencies afford the best means for general comparison and thus tend to promote a clearer comprehension of the manifold phases of the evolution of genera. The fact that specific characters sometimes make their appearance in individual development before generic features is most suggestive. For the laws of "science and growth,"[1] first made known by Heckel, and since extended by Hyatt to the *Cephalopoda*, Jackson to the *Pelycypoda*, and Beecher and Clarke to the Brachiopoda, the term auxology[2] has been lately proposed by English systematists, with some elucidative and etymological modifications in Hyatt's terminology. These principles govern individual and specific development of genera. For genera are stages in the life history of the race as distinguished from the genealogical records of the individual. It would seem, however, that just as the co-existence of a large number of individuals tends to perpetuate specific variation, so the simultaneous occurrence of abundance of species in one horizon and area is productive of the divergence of genera.

We cannot enter further into details; enough has been written to show beyond contradiction the value and interest of his "Introduction to the Study of the Genera of Palæozoic Brachiopoda," with its concise descriptions of genera and passage-forms, their inter-relations, and affiliated species. It is rendered complete by excellent specific bibliographies, well considered genealogical trees, showing the common ancestry, diverging lines of descent, and affinities of genera with their geological range, a register of genera and of species, authors' and general index. The work is most creditable to Professor James Hall and his assistant, Mr. J. M. Clarke, and reflects honor on America in general and the State of New York in particular. It deserves to be carefully studied by invertebrate biologists in both hemispheres. We trust the publication of the second part will be proceeded with, and that by its rapid completion, on similar lines of thought, science may be enriched by a general view of the evolution of the Brachiopoda. It is much to be desired that the relations of the secondary and tertiary species should be discussed in a like thorough, philosophical, and generally satisfactory manner.

We have become so convinced of the advantages of this method of treatment, that we have begun to form the nucleus of a collection in the Brighton Museum, destined to illustrate the evolution of genera among the Brachiopoda.

ON THE SO-CALLED INCAS EYES.

BY W. S. MILLER, UNIVERSITY OF WISCONSIN, MADISON, WIS.

AT the time of the earthquake and accompanying tidal-wave which swept over Arica, Peru, August 13, 1868, causing so much destruction of life, property, and shipping, the U. S. man-of-war "Kearsarge" was lying some two hundred miles down the coast. The shock there was comparatively slight to what it was at Arica. Word was received the following morning of the disaster up the coast, and the vessel left immediately to render such assistance as lay in its power. The history of that earthquake is well known. I will refer any who may wish to read an account of the occurrence to an article in *Harper's Monthly* for April, 1869. The late Lieutenant Gardner, U. S. N., was at that time stationed on the "Kearsarge," and it is to him that I am indebted for the material which forms the subject of this article.

After the officers of the "Kearsarge" had rendered what assistance they could towards alleviating the distress caused by the earthquake, they turned their attention to the havoc wrought by the shock and tidal-wave. Prominent amidst the debris, and about a quarter of a mile from the shore, they found a number of so-called "mummies," which had been exposed by the receding tidal-wave. These Peruvian mummies are not mummies in the same sense that we speak of those of Egypt. The Egyptian mummies were preserved artificially from putrefaction by being embalmed, an art peculiar to the people of that country; but the Peruvian bodies are simply desiccated, the conditions of the atmosphere and soil being conducive to their preservation.

The mummies are usually found in vaults or chambers of adobe, roofed with sticks or canes and a layer of rushes; these usually contain several bodies, which are placed in a sitting posture, the chin resting on the knees, the hands being clasped around the knees. Sometimes the face rested on the hands, with the elbows crowded down between the thighs and abdomen. The bodies are wrapped in native cloths and bound with cords. A small thin piece of copper was usually placed in the mouth; this corresponded to the *óbolos* which the ancient Greeks put into the mouths of their dead as a fee for Charon. They were accustomed to bury with them such utensils as they were supposed to need in the country to which they journeyed. The farmer had seeds of various kinds and agricultural implements placed about him; the fisherman had his net wrapped about him, and nearby fish-hooks were placed with barbs wonderfully like those in use at the present time. The wealthy had costly articles in pottery and precious metals buried with them, and it is on account of this custom that many graves have been opened with the expectation of finding valuables. The women had their spindles for spinning, and in some instances the last thing they did before leaving their work forever, as shown by the unfinished web of cloth placed about them. Flowers were found by Lieutenant Gardner as fresh to the eye as if plucked only a short time previous, but of course in a dried state.

Articles of the toilet were also found, such as mirrors, combs made of fish bones set in wood, and hollow bones of birds carefully plugged with cotton and filled with pigments of various colors, while close at hand was the swab used in applying them to the face. Rings were in some instances of the precious metals, but all those seen by Lieutenant Gardner were made of copper; he also found implements for sewing. The children were surrounded by toys of native make.

On account of their nearness to the shore and their surroundings, it is highly probable that the mummies seen by Lieutenant Gardner were those of fishermen and their families.

The most interesting thing about these mummies is the finding of the so-called "Incas eyes." These were of various sizes, corresponding to the age of the individual.

These eyes are of an oval outline, flattened at one end and made up of concentric layers deposited about a central point. They are brittle and quite iridescent. They were found in the orbit, being held in place by the cloth which was bound about the head. Lieutenant Gardner was not certain whether they were placed under the eyelid — the eye being removed — or were outside the lid. His impression was, that they were outside, as they fell out as soon as the cloths which bound the head were removed. I cannot find any reason why they were used.

At first, I thought the eyes were composed of some resinous substance, but as soon as I began to examine them critically, I found that my first impression was erroneous. After examining sections and fragments, softened by long immersion in glycerine, I came to the conclusion they were the crystalline lens of some animal.

The next point to decide was from what animal they were taken. A clue was given by the fact that fragments left in distilled water for a day or two under a dust-shade, developed an odor which I could compare to nothing but that of old bilge water. Although this was a very questionable clue, yet it led to the successful solution of the question.

If the eye of a cephalopod be removed and carefully opened, it will be found that the "anterior of the retinal chamber is occupied by a bi-convex lens divisible into a smaller outer and a larger semi-globular internal part, the two being separated by a membrane." The principle of the well-known Coddington lens is the same as that which enters into the formation of this eye. The posterior portion of this eye is the one made use of by the

[1] αὔξη, growth, and λόγος, science.

[2] See a paper entitled "The Terms of Auxology," by S. S. Buckman, F.G.S., and F. A. Bather, M.A., F.G.S., London, in the Zoölogischer Anzeiger, No. 405 and 406, p. 42 1, Nov. 14 and 28, 1892.

ancient Peruvians. The source of supply was doubtless from the squid or octopus, which are still found in abundance along the coast.

CURRENT NOTES ON ANTHROPOLOGY.—XXII.

[Edited by D. G. Brinton, M.D., LL.D.]

The Canstatt and Neanderthal Skulls.

EVEN in some very late treatises on archæology and ethnology I observe that there is still talk of the "race of Canstatt" and the "race of Neanderthal," these imaginary races of ancient Europe being supposed to be represented by the skulls found in those respective localities. The late M. de Quatrefages was, I believe, responsible for the erection of these skulls into "types," and for the theories of prehistoric ethnography based upon them.

It should be recognized, once for all, that there is no sort of foundation for these scientific dreams. In neither instance did the locality in which these skulls were found guarantee them any high antiquity. The Canstatt skull was unearthed along with Roman pottery, and in all probability belonged to the fourth or fifth century, A. D. The Neanderthal skull, on which still greater stress has been laid, and casts of which are to be seen in most archæological museums, was not dug up at all, but was picked up in a gully which had been washed in the mountain side, and came from dear knows where. Probably there had been an old graveyard further up the hill, but by no means one in quaternary times. The fragment, moreover, is so fragmentary, and presents such evident signs of pathologic processes, that it is more than daring to assume it as the typical cranium of any race.

These and many allied facts in the same direction were admirably brought out in a discussion last August at the meeting of the German Anthropological Association by such speakers as Von Holder, Virchow, Kollmann, and Fraas. Their arguments leave no room to doubt the unimportance of these remains.

Time-Reckoning of the Mayas.

A short but carefully studied article in a recent number of the *Globus* (Bd. 63, No. 2), by Dr. Förstemann, presents some striking facts showing the accuracy attained by the ancient Mayas of Yucatan in the calculation of time. His sources are the Dresden and other ancient codices, to the interpretation of which he has devoted fruitfully much study. The contents of the Dresden Codex is largely astronomical or astrological, several of its pages being comparisons of the relative times and positions of the heavenly bodies. It is clear that these sky-readers had ascertained that the mean synodical revolution of Venus is 584 days, which is correct to a very small fraction. They had fixed the revolution of Mercury at 115 days, and it is probable but not quite certain that they had rightly estimated the revolution of Mars at 780 days. Jupiter and Saturn they did not study, or, at least, take into these calculations.

Not less surprising was the accuracy they reached in measuring the lunar month. They had by their observations reduced it to 29.526 days. This is about five minutes in the month too short, as the true synodical revolution is 29.53 days. For this differencs, intercalary days would be required at certain epochs.

It is probable from this that the Mayas were ahead of any other American stock in the measurement of time, exceeding even the Mexicans; though these also appear to have discovered the length of the year of Venus. Dr. Förstemann's discussion of the subject amounts to a demonstration, and merits the close attention of students of Maya civilization.

The Co-Existence of the Mammoth and Man.

Not long since, the distinguished and venerable archæologist, J. Steenstrup, of Copenhagen, published a paper examining the discoveries in Europe which are supposed to prove the contemporaneity of man with the mammoth; and reached the conclusion that not only is the evidence inadequate, but for climatic and geologic reasons no such co-existence was possible.

At the last meeting of the German Anthropological Association Professor Virchow quoted Steenstrup's conclusion and endorsed it, as did also others present. The "reindeer period" was the remotest to which they were willing to assign the appearance of man in Europe on existing evidence. The artefacts of mammoth teeth and bones found in the caves were asserted to be from fossil remains picked up by the cave men. Where such artefacts are found in gravels along with mammoth bones, they would say that these gravels are themselves posterior to the reindeer period, and hence contain objects of various preceding periods.

There remains for consideration the delineation of a mammoth on a bone from the Lena cave in the south of France. This was but discussed, being probably considered of questionable origin. In the United States two such delineations have been brought forward. They are both strikingly similar to this French original, which has long been made familiar to American readers through various publications. Both proceed from the valley of the Delaware River. One is on shell and one on stone. I have examined both originals very carefully, and apart from the vagueness which surrounds the finding of both, for purely technical reasons I believe both to be recent. There still lacks conclusive evidence that man and the mammoth were contemporaneous in the area of the United States.

Proposition for an Ethnographic Study of the White Race in the United States.

In preparing some lectures last winter on the ethnography of the United States, I was struck with the deficiency of trustworthy material on this subject. The Indians and the Negroes have received far more attention at the hands of ethnologists than the whites. It is high time that a systematic study be made of the latter, with a view to discover what influences the New World and its conditions have exerted on this race wholly foreign to its soil.

I would propose that a plan be adopted similar to that which has recently been outlined in Great Britain for an ethnographic survey of that kingdom. A joint committee has been appointed by the leading anthropological, antiquarian, and folk-lore societies to raise means and carry out details. A list of certain typical villages will be made in which there are at least a hundred adults whose ancestors are believed to have lived a number of generations in the district, and to have been subjected to a minimum outside influence. From this list the committee will select the most promising places, and will send a properly equipped student to record the following points:—

1. Physical type of the inhabitants by measurements, photographs, etc.
2. Peculiarities in dialect, local pronunciations, expressions, etc.
3. Local traditions and superstitions.
4. Old buildings, relics, and other antiquities.
5. Historical evidence and genealogies showing purity of race.

Such a plan could be most advantageously carried out in the United States. Suppose thirty students were selected, trained, and sent to pass their summer vacation in as many secluded villages in New England, the Middle States, and the oldest settled portions of the South, all pursuing their investigations on the same lines. We should receive a mass of the most valuable information by which to solve many most interesting and instructive ethnographic problems. One pleasant feature would be the very moderate expense for which this could be accomplished; for these secluded villages are precisely where one can live the cheapest in the whole country.

We could then compare the descendants of the middle class English who settled New England with those of the Scotch-Irish and Palatine Germans of Pennsylvania, with the French of South Carolina and Louisiana, the settlers of the mountains of Virginia and East Tennesse, the "crackers" of Georgia, and so on. Will not the active societies in the United States interested in these lines of research unite their efforts to realize some such project?