tremata it becomes attached to the ventral valve, as in Neotremata. In the two last named orders it modifies the pedicle opening. For this and other ontogentic and morphologic characters Owen's terms Lyopomata and Arthropomata are abandoned. The Atremata and Telotremata are provisionally arranged under the superordinal term *Homocaulia*, and Neotremata and Protremata under *Idiocaulia*.

A true deltidium is present in the *Acrotretacea* of the Neotremata and in the Protremata.

"The cirrated lophophore, or brachia, is alike in the larval stages of all brachiopods. They first develop tentacles in pairs on each side of the median line in front of the mouth (taxolophus stage). New tentacles are continually added at the same points, until by pushing back the older ones there is a complete circle about the mouth (trocholophus stage), later becoming introverted in front (schizolophus stage). From this common and simple structure all the higher types of brachial complication are developed through one of two methods: (1) the growing points of the lophophore, or points at which new tentacles are formed, remain in juxtaposition; or (2) they separate. Complexity in the first is produced (a) by lobation, as in *Magathyris*, *Eudesella*, *Bactrynium*, *Thecidea*, etc. (ptycholophus type), and (b) by looping (zuglolophus) and the growth of a median, unpaired coiled arm (plectolophus), as in *Magellania*, *Terebratulina*, etc.; in the second (c) by the growth of two, separate, coiled extensions or arms, one on each side of the median line (spirolophus), as in *Lingula*, *Crania*, *Discinisca*, *Rynchonella*, *Leptæna*, *Davidsonia*, *Spirifer*, *Athyris*, *Atrypa*, etc." [Charles E. Beecher.]

Morphological equivalents, or similar structural features, are developed independently, as follows: A spondylium in *Obolacea*, *Lingulacea*, *Pentameracea*, and rarely in *Spiriferacea*; crural processes in *Pentameracea* and *Rynchonellacea;* functional articulation in Protremata and Telotremata; straight, more or less long, cardinal areas from rostrate forms in *Rynchonellacea*, *Spiriferacea* and *Terebratulacea*; rostrate shells from long cardinal areas in *Pentameracea*; and loss of pedicle and ventral shell cementation in *Craniacea*, *Strophomenacea* and *Spiriferacea*.

Charles Schuchert.

U. S. National Museum.

ASTRO-PHOTOGRAPHIC WORK TO BE CARRIED OUT AT COLUMBIA COLLEGE OBSERVATORY.

One of the great difficulties that has stood in the way of attaining the highest precision in photographic astrometry has been the determination of a possible distortion of the field of the photographic telescope. Some years ago Dr. Gill tried to meet this difficulty by recommending the possessors of photographic telescopes to make a series of pictures of the group of stars he had used as comparison stars for the planet Victoria in his Solar Parallax work. These stars had been very carefully determined, both in the meridian and with the heliometer, so that a mere comparison of the photographic coördinates with the others ought to throw considerable light on the question of the optical distortion of the photographic telescope. This process has been very carefully carried out by Donner, at the Helsingfors observatory. But the result he has secured leaves the matter still in doubt. His determination of the optical distortion of the Helsingfors telescope by Gill's method does not possess sufficient weight. The cause of this partial failure of Gill's method must be sought in the unfavorable distribution of the Victoria stars for the purpose in question, in the small remaining errors of Gill's star positions, the uncertainty of the proper motions, and perhaps also in the low alti-

tude of these stars in the latitude of Helsingfors.

Some time ago I pointed out in the Astronomical Journal that the best method of investigating that portion of the optical distortion which depends on position angle would be to photograph the stars surrounding the pole several times, with widely different readings of the hour circle. In this way the quantity sought will not be dependent on star places or proper motions, and a very favorable distribution of the stars can easily be secured. Such a research can be made to furnish incidentally a very accurate catalogue of the stars surrounding the pole.

Through the courtesy of Dr. Gill and Professor Donner I have secured a collection of polar plates of the two poles specially made for the present purpose, and I propose to effect the measurement and reduction of these plates at Columbia College, using the Repsold photographic measuring machine recently presented to the College by Mr. Rutherfurd Stuyvesant. The plates are twelve in number for each pole, and are symmetrically distributed about the pole in the manner most favorable for the purpose in hand. It is to be noted also that the observatories of the Cape and Helsingfors are the most favorably situated respectively for the North and South Poles. We may therefore confidently expect considerable information on this difficult point; if the present research can be carried to a successful conclusion.

Other astro-photographic work going on under my immediate supervision includes the re-measurment of the old Rutherfurd plates of the Pleiades which were discussed in my paper on that group of stars. It is hoped that this re-measurement will show that the old plates have not deteriorated. If this be the case we can proceed at once to the measurement of a great number of Rutherfurd plates that have never been measured at all. The great importance of these plates arises from the fact that they have a thirty-year precedence of all other plates for the purpose of making a study of proper motions.

Dr. Davis has been working on the reduction of the plates measured by Rutherfurd and has carried several clusters almost to completion. These include the stars surrounding Mu Cassiopeiæ, 1830 Groombridge, 61 Cygni, and one or two others. All these are being computed in a manner similar to the process used in the case of the Pleiades. Dr. Davis also has in hand a study of the relative masses of the two components of the double star Eta Cassiopeiæ, from the Rutherfurd measures recently published by him. This work is being done according to formulæ which I presented at a recent meeting of the New York Academy of Sciences. Especial thanks are due to Prof. J. K. Rees, director of the observatory, who has done everything in his power to further the prosecution of the above researches.

Among other researches of importance which cannot be actively pushed at present, on account of insufficient assistance, I may mention the measurement and reduction of a series of plates of the stars used by Gill for comparison with the planet Victoria in his Solar Parallax work. These plates were made at the Cape Observatory about the time of the Victoria observations, and they have been placed in my hands by Dr. Gill for discussion. The plates are now at Columbia College. All the plates to which reference has been made in this notice, except Rutherfurd's, are provided with a 'Réseau,' or network of straight lines photographed on the plate. By the aid of this réseau it is certain that we can eliminate the effects of any distortion of the film during development. The measurement is also greatly facilitated by it. It is to be hoped that Columbia College will in time possess

an organized Bureau of Measures, where astro-photographic researches can be carried out for other astronomers who have not the facilities or the means of doing the work themselves. HAROLD JACOBY.

CURRENT NOTES ON ANTHROPOLOGY (XIII.)

ANCIENT METAL INDUSTRY IN THE CAUCASUS.

A VALUABLE monograph has lately appeared, by Professor Rudolph Virchow, in the Proceedings of the Prussian Academy of Sciences under the title, 'The Culture-Historical Position of the Caucasus, with special reference to the ornamented bronze girdles obtained from Trans-Caucasian graves.'

It appears that from the oldest burial sites in Trans-Caucasia specimens of metal-work are exhumed, remarkably beautiful in design and proving a highly developed technique. Careful studies have shown that this was not an indigenous industry. The artists had learned their trade elsewhere, or had immigrated from other lands. They were not in close relation with the contemporary art of Armenia; nor is the Assyrian or Babylonian influence especially pronounced, though at times visible. The art motives are unlike those which prevailed in Europe. Perhaps the connection should be sought with the prehistoric culture of Persia; but of this we have at present too few examples to speak of it positively. This much Dr. Virchow makes clear: That the Caucasian art was not developed *in situ*; that it was unexpectedly rich; that it is Oriental in inspiration; and that it points to some older center of culture not yet located.

ALLEGED WESTERN ORIGIN OF CHINESE CULTURE.

READERS acquainted with the voluminous writings of the late Terrien de La Couperie will recall the zeal with which he expounded and defended the theory that the origin of Chinese culture should be sought in Mesopotamia, among the Elamites of Susa. A number of them, he claimed, migrated eastward, carrying with them an advanced civilization, and appear in Chinese history as the 'Bak' tribes, those now referred to as the *Pe Sing*, 'the hundred-named.' He further explained that *Pe*, *Pek*, or *Bak*, was in origin a *nomen gentile*, non-Chinese in derivation, but assigned a meaning later in that language. These opinions he defended with much vigor.

They have, however, been completely demolished by M. de Harlez, in the October number of Schlegel's *Archives de L'Orient*. His exhaustive discussion of the etymology of *Pe Sing* leaves no doubt of the incorrectness of de La Couperie's assumption; and the theory of the extension of the Mesopotamian culture into China, as well as that of the imagined presence of the true Mongolian race in the Euphrates Valley in prehistoric times, are both rudely shaken. In a paper on 'The Proto-historic Ethnography of Western Asia,' which I published last spring in the Proceedings of the American Philosophical Society, I pointed out how frail was the foundation of both assumptions.

A NEW THEORY ABOUT THE MEDITERRANEAN RACE.

PROF. GIUSEPPE SERGI is well known for his extended anthropological studies, and especially for his novel craniological methods. Quite recently he has published a volume of 144 pages with a map and outlines of skull forms, to make known his conclusions on the origin of the Mediterranean race (Origine e Diffusione della Stirpe Mediterranea, Roma, 1895).

After clearing the ground of a number of opinions contrary to his own, he proceeds to demonstrate that the ancestors of the Egyptians, Aryans, Libyans, Pelasgians and Etruscans migrated from a 'center of diffusion' in Africa, near the headwaters