ment of *Gymnarchus* (the first of the Mormyridæ to be made known embryologically) by Richard Assheton; and shorter articles by Mr. Boulenger on the fishes of the Gambia, by Dr. Bles on the development of the Anura; and one by Mr. Browne on a fresh-water medusa, discovered by Budgett in the delta of the Niger, that seems to be identical with the Limnocnida found in Lake Tanganyika. It is impossible here to review the results of these works in detail, but a special word should be spoken in commendation of the excellence, and often the truly artistic quality, of the illustrations, many of which are from Budgett's own drawings.

Budgett showed a rare union of technical skill and morphological insight in laboratory research with uncommon abilities as a field naturalist. His diaries reveal a true lover of nature, one having a wide range of interests in living things, alertly awake to natural beauty, and steadfastly unsparing of himself in the pursuit of his special aim. His was not the only life to be sacrificed in the pursuit of the *Polypterus* development. Nathan R. Harrington died at Atbara in the summer of 1899 while leading an expedition sent out from Columbia University on the same quest. The results attained through Budgett's success are of great and permanent value to science, but they have cost a heavy price.

W.

A Popular History of Astronomy during the Nineteenth Century. By Agnes M. Clerke. New York, The Macmillan Company. 1908. Pp. vi + 489. $2.75 net.

This is a reprint, without change, of the fourth edition, which appeared in 1902 and was widely reviewed at that time. This well-known work is accurate, lucid and interesting. It is already on the shelves of every astronomer's library, but should more universally be found in school and circulating libraries.

It is to be regretted that the few errors and omissions which are to be found in the fourth edition were not corrected in this reprint. Failure in this respect is doubtless due to the lamented death of the author in 1907. The publishers, however, should have had made such obvious and easy corrections as the change in the date of the death of Lassell from 1818 to 1880 (p. 83), and the substitution of the word "gemination" for "germination" when describing the canals of Mars (p. 279), and should have supplied in Table V. the missing but easily obtainable data regarding focal lengths of various telescopes listed therein.

Storrs B. Barrett

SCIENTIFIC JOURNALS AND ARTICLES

The July number (volume 9, number 3) of the *Transactions of the American Mathematical Society* contains the following papers:

W. H. Roever: "Brilliant points of curves and surfaces."

Oswald Veblen: "Continuous increasing functions of finite and transfinite ordinals."

E. J. Wilczynski: "Projective differential geometry of curved surfaces (third memoir)."

A. L. Underhill: "Invariants of the function $F(x, y, x', y')$ in the calculus of variations."

R. G. D. Richardson: "The integration of a sequence of functions and its application to iterated integrals."

SPECIAL ARTICLES

DEGENERATION, ALBINISM AND INBREEDING

In a paper before the American Philosophical Society last spring I showed that often when the two parents have any organ or quality A in two conditions, A + and A —, of which the former is a highly developed or progressive condition, the latter a poorly developed or even absent condition, the former condition will regularly dominate over the latter. In the particular case of human hair color we find, for example, that children are not ordinarily darker than their darker parent. Consequently, if both parents have flaxen hair the children will have hair of the same sort. From this principle, applied generally, it follows that when both parents have an organ in a low condition of development it will be so also in all of their children. This principle explains the persisting or increasing degeneration in the descendants of two degenerate parents.

When one parent has an organ in a minus

condition and the other in a plus condition the condition of the organ in the children will depend upon the germ cells (and hence on the parents) of the advanced parent. If half of its germ cells are in the minus condition, as may be the case, half of the children will have the organ in question in the minus condition. Even if both parents are in an advanced condition, if they both have the less advanced condition recessive, one quarter of their offspring will have the organ in a minus condition.

The foregoing principles help us to understand the reason for the degeneration that sometimes, but not always, follows inbreeding. If the children can not rise above the level of their parents but may fall below in respect to any organ, it is plain that if brothers and sisters were to mate the average of the offspring would rapidly run down hill to the zero condition of the organ. In the mating of cousins the same result would tend to occur, but not so rapidly and certainly. The more foreign blood introduced the less the danger of degeneration.

Another class of degeneration is illustrated by albinism. Studies that Mrs. Davenport and I have been making show that there are in human hair two pigments, black and red, occurring in various dilutions and combinations, as will be more fully set forth in our paper on human hair color to appear shortly in the *American Naturalist*. There are, however, cases of black (*N*) hair with no red (*r*) pigment, and of yellow or red (*R*) hair without black pigment (*n*). The gametic formula of the former is *Nr* and of the latter *nR*. The grandchildren of *Nr* and *nR* consorts will have hair of either of four kinds: black-and-red (*NR*, chestnut, or mahogany colored), jet black (*Nr*), clear yellow or red (*nR*), and colorless (*nr*); the latter are albinos. Studies that I have been making on albinos reveal an ancestry in conformity with this hypothesis. We see, then, that albinism is not a sport occurring in wholly arbitrary fashion; but a necessary, predictable result of certain combinations of gametes. The only part that inbreeding plays is to make more probable the necessary combination of gametes. The degeneration in this case follows from the union of two negative factors in dihybrids; and this is a common cause of degeneration.

CHAS. B. DAVENPORT

THE QUESTION OF CYCLOPIA, ONE-EYED MONSTERS

Two summers ago I found it possible to produce one-eyed fish embryos by means of $MgCl_2$ solutions in sea water.[1] At that time the spawning season of the fish used, *Fundulus heteroclitus*, was nearing a close, so that it was impossible to obtain material showing the early conditions of the defect or to rear the embryos in order to observe their actions after hatching.

During the present summer more extensive experiments have confirmed the fact that cyclopean embryos may be produced in any number desired by treating the eggs with $MgCl_2$ or $Mg(NO_3)_2$ solutions. The effect seems due to the Mg ion in the presence of certain sea-water salts. The embryos may be hatched and the cyclopean eye seems functional, many of the fish swimming in a normal fashion and responding to light. These free-living cyclopean fish may be kept for as long a period as the normal swimming embryos, a period of eight or ten days, after hatching, at which time all die of starvation, since the entire content of the yolk-sac has been absorbed and no other food is furnished. The cyclopean individuals could doubtless be reared if their proper food was known.

A study of these cyclopean embryos from the first appearance of the optic vesicles to hatching, both in life and sections, has proved that the earliest indication of an eye is just as truly cyclopean as it will be later. All degrees from a perfectly single organ through various conditions of doubleness to two intimately approximated optic cups may be found in young embryos. My former statement that the cyclopean eye resulted from a fusion of the elements of the two eyes after their formation, a statement based on comparisons of cyclopean eyes in late stages of development, is incorrect, as is also a similar idea advanced by Dr. Mall in his recent paper.[2]

[1] Stockard, *Archiv für Entw.-Mech.*, XXIII., 1907.

[2] Mall, *Jour. Morphology*, XIX., 1908.