very remarkable, because, on account of an accident in the treatment, a failure or a poor positive had been expected. Several repetitions of this treatment had failed to yield this result again.

It is frequently observed that with a strong pyrocatechin developer the picture will start as a negative in the light, and will reach a fair degree of excellence, and then reverse. This is in the nature of an oscillation such as is known in electric discharges. The phenomenon is not observed in a weaker or in a more slowly acting bath. The anomalous case before referred to could hardly be accounted for in this way, because the picture developed very slowly in a normal hydrochinon bath, and grew steadily better until it was sharply defined on the back of the film. This case is still being examined.

A short biographic sketch of the late Charles Pierre Chouteau, a charter member of the Academy, who in its early years, as the western representative of the American Fur Company, contributed many important collections to its Museum, was presented by a committee appointed for that purpose.

Two persons were elected to active membership.

WILLIAM TRELEASE,
Recording Secretary.

DISCUSSION AND CORRESPONDENCE.

A FIELD FOR MOSQUITO THEORISTS.

CLIMATIC CONDITIONS ON THE UPPER CONGO.

TO THE EDITOR OF SCIENCE:—The following extracts from letters of Father Grison, a Missionary at Stanley Falls, and Mg'r Roelens, Vicaire Apostolique of the Upper Congo, addressed to the Société Antiesclavagiste of Belgium, may be of interest. G. R. S.

WASHINGTON, D. C.,
February 12th.

At Stanley Falls the climate is very agreeable, but is formidable, as the victims of fever are too numerous. Europeans have very inaccurate ideas of tropical temperatures. I have passed eight years at the equator on the Pacific Coast, and have never seen the mercury above 29° C.

Here the maximum is 32° C. and the nights are deliciously cool. This is our climate all the year.

There is, however, a reverse to this picture. We have frequent tempests of indescribable violence; I have counted in one minute during a diluvial rain and continuous thunder, sixty-six flashes of lightning; and have seen in two hours within a radius of a few hundred meters, ten *coup de foudres*.

Mg'r Roelens at M. Pala, writes:

The work of the Mission allows me little leisure for anything else than an occasional attack of fever.

The fever, however, does not ask if you have the leisure, but imposes it at will, and unhappily, a little too frequently.

Dame fever reigns as mistress of the country.

In the rainy season, from November to May, her tyranny is most severely felt; no one escapes attack; the newly-arrived are most susceptible, but the old residents are not completely immune.

Those who have been resident more than a year are the chosen victims of the terrible hæmaturic fever (Malarial hæmaturic, or 'Swamp fever.') In five years' residence I have had the fever fourteen times! For the last two years, fortunately, it has left me in peace.

Brother Stanislas, who has resided here since 1893, is now sick with it for the twenty-fifth time.

It is an old saying here that the third attack is always mortal.

We, however, have passed the period when our lives are despaired of; this result is due to the treatment we have followed here.

Since 1892 the missionaries of the Upper Congo have applied this treatment to seventy-five cases of this fever, of which five only have been fatal.

Beside this there are no other grave climatic dangers for Europeans. The dysentery, which elsewhere is a serious menace, does not occur here.

I suspect that the English at the south of us find this malady more frequently in their boxes of conserves, and in *la dive bouteille*.

At this moment an epidemic of smallpox is invading the country. It is said here that this recurs every seven years, and attacks all who escaped the previous invasion.

We cannot depend upon the vaccine of Europe, because of the long voyage and the great heat.

I have given it many trials without result.

SHORTER ARTICLES.

ARE THE AUSTRALIAN MARSUPIALIA OF OPOSSUM DERIVATION.

AT the last meeting of the American Association for the Advancement of Science, in June, 1900, the writer presented some reasons in

favor of the view that the Australian Marsupials have been derived from opossum-like ancestors. Since then the opportunity has been afforded of examining the case in greater detail, and it may accordingly be of interest to notice certain of the results obtained.

As nearly every writer who has dealt with the group has observed, the Australian Marsupials exhibit extensive resemblances to Placentals in respect to certain features of their outer organization, notably the adaptive modifications of the teeth and feet. By means of a very reliable, though roundabout method, this fact may be made effective use of in determining the character of the Marsupial ancestors. Thus, by reference to the paleontological history of Placentals, it is possible to recognize the sequence of events in the development of their structural modifications, and from this to infer a similar sequence in the similar modifications of Marsupials. Then, by carefully excluding those forms which show obvious signs of degeneration, it is possible to select from the others those modifications which are primitive or original from those which are secondary or derived.

Such an analysis is easily effected because the Australian Marsupials, notwithstanding their great diversity of form, constitute an extremely simple and homogeneous group. They show no indications of having been derived from more than one ancestral type.

The stem-form is found to have possessed the following characters, or more primitive ones: Dental formula

$$i.\frac{5}{3}\ c.\frac{1}{1}\ p.\frac{3}{3}\ m.\frac{4}{4};$$

upper molar teeth triangular, each with three main cusps and an outer row of incipient styles; lower molar teeth each with an anterior triangle of three main cusps, an antero-external shelf, and a posterior heel with three terminal cusps. Foot with the great toe opposable, but with the other digits normal.

These characters are not found together in any one of the Australian forms, but, with one minor exception,* are exactly reproduced in the American opossums.

* The opossums have four lower incisor teeth.

In addition, it appears entirely probable that other structural modifications of the Marsupial organization are also departures from an opossum type. The anteriorly opening pouch of the kangaroos, wallabies, and phalangers, and the posteriorly opening pouch of the bandicoots appear to be modifications of a type like that met with in the opossums, where the opening of the pouch is directed vertically downwards. This condition has been preserved in the Australian dasyures. Again, it is probable that a scaly prehensile tail, like that of the opossums, has to be ascribed to the Marsupial stem-form, since various grades of an apparently disappearing prehensilism are to be met with in the phalangers.

There is also the significant fact that during the Oligocene period opossums were widely distributed throughout the northern hemisphere and that at a slightly later period opossum-like forms (Microbiotheriidæ) existed in South America. To this may now be added the probability that it was at about the middle of the Tertiary that the Marsupial radiation began. Of the latter there is the following evidence: The most advanced modifications of the teeth and feet in Marsupials (kangaroos) are decidedly primitive as compared with the most advanced modifications of the same structures in Placentals (Ungulates, especially the horses). Furthermore, although the Marsupials possess the representative characters of Placental orders, it is barely possible to separate them, in some cases, into families. Both of these facts indicate that the Marsupial radiation has been of much shorter duration than that of the Placentals, and therefore, if the Placental radiation began in the Cretaceous or early Eocene, the Marsupial radiation, as indicated above, could not have begun before the middle of the Tertiary.

If these indications are reliable, it would appear that the entire Marsupial fauna of Australia has been derived by a comparatively recent adaptive radiation from a single ancestral type, of which the American opossums are the existing representatives.

Naturally the greatest objection to such a view is the fact that there are no opossums in Australia at the present time. This difficulty is, however, quite a superficial one. If we

imagine the opossums to have originally gained access to the region, is it not preeminently fitting that, in establishing the foundation of an extremely comprehensive adaptive radiation, and under the favorable conditions of an absolute freedom from competition, they should have thrown aside their original didelphyid characters? And especially is this conceivable when we realize that the differences of structure separating the opossums from the most primitive of the Australian forms (dasyures) are extremely slight.

However unprogressive the opossums may at first sight appear to be, they are still plastic types. That they are at the present time attempting to radiate in South America is apparent from the numerous subgeneric divisions which it has been found necessary to establish,* and more especially from the fact that one form (Chironectes) has already become completely adapted to an aquatic life.†

The above conception approximates closely the general opinion, expressed by Lydekker,‡ in 1896, that the opossums and dasyures are the descendants of a common ancestral stock, but differs in assuming that these ancestors were opossums, and that they were formerly present in Australia. If we assign to the ancestors of the dasyures characters which would allow them to constitute the Marsupial prototype, they would no longer be Dasyures, but opossums. Ameghino has suggested the South American Microbiotheriidæ as ancestral to the dasyures, and Bernard (Éléments de paléontologie) regards the border as opossums.

B. ARTHUR BENSLEY.

COLUMBIA UNIVERSITY,
November 5, 1900.

WORK AT THE MARINE BIOLOGICAL LABORATORY OF WOOD'S HOLL, 1900.

THE course in physiology should be classified as a kind of research. The same is true in large measure of the course in embryology. In both of these courses, for instance, Dr. Loeb's experiments on artificial parthenogenesis were successfully repeated. Both of these courses are attracting students from medical colleges who feel the need of getting away from the strictly conventional physiology and embryology, into touch with the new lines opening up—in physiology, with the comparative study of biokinetics and in embryology with the new lines of thought introduced by experimental work and by the studies in cell-lineage. Both of these courses, as given here, are largely the outcome of the results of research of preceding years by members of the laboratory, who are themselves concerned in giving the instruction. They therefore represent the spirit of the laboratory along these two lines of investigation.

As regards investigation proper :—In PHYSIOLOGY, Dr. Loeb has continued his experiments on artificial parthenogenesis and has succeeded in inducing the development of unfertilized eggs of Annelids (see a recent number of SCIENCE). Other lines of work in physiology concern the chemical stimulation of nerves, the physiological effects of inorganic salts on the rhythmical activity of living tissues, similar studies on ciliary motion; and work on regeneration by several investigators.

In CYTOLOGY: work on *spermatogenesis* has been carried on by Dr. Montgomery, Mr. Downing and Miss Wallace; on *ovogenesis* by Mr. Arthur E. Hunt, Dr. H. E. Crampton and Dr. C. M. Clapp; on *fertilization* by Dr. Conklin, Miss Katharine Foot, Miss Strobell, Dr. F. R. Lillie, Mr. Martin Smallwood. Dr. E. B. Wilson has brought here his experimental work on fertilization and cleavage in the sea urchin eggs.

In EMBRYOLOGY work has been carried on in various lines: *Annelids* by Dr. A. C. Treadwell and Mr. R. S. Lillie, *parasitic copepods* by Mr. Edward Rynearson, *Cirripedia* by Mr. M. A. Bigelow, *fishes* by Dr. Cornelia M. Clapp, Miss Robinson, Dr. Neal and Miss A. C. Smith, *Monotremata* by Mr. B. A. Bensley, *Histogenesis of gastric glands of Amphibia* by Dr. R. R. Bensley, *Planaria* by Mr. W. C. Curtis, *Nucula* by G. A. Drew, *Parasitic Isopods* by J. R. Murlin.

The work in NEUROLOGY included the following: V. E. McCaskill on nervous system and metamerism of *Hirudo*, Mr. Fling

*Cf. Thomas, O., 'British Museum Catalogue of Marsupialia and Monotremata,' London, 1888, pp. 317–322.

†Cf. Gadow, H., 'On the systematic position of *Notoryctes typhlops*, P. Z. S.,' London, 1892, p. 370.

‡Lydekker, R., 'A Geographic History Mammals,' Cambridge, 1896, p. 55.