it was thought advisable not to attempt extracting the fetal forms completely from their matrix. They were mounted with the mother skeleton pretty much as found without attempting, however, to place them in theoretically exact position.

The School of Mines has had a collecting party in the White River Badlands during the last six field seasons. The results of this work have been most gratifying in that the institution now has a large collection, representative of this important life period, much of which has been prepared, mounted and placed on exhibition. The collection contains an especially good representation from the Protoceras channel beds.

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BABYLONIAN MATHEMATICS

IN my address on "Mathematics before the Greeks" recently published in SCIENCE[1] I quoted a statement from Smith's "History of Mathematics"[2] to the effect that "in a tablet from Sennacherib's palace (about 700 B. C.), now in the British Museum, a circle is divided into 480 equal parts." Professor Smith does not give any authority for this statement but informed me privately that he probably learned of the fact during a visit to the museum. On appealing to Mr. C. J. Gadd, of the Department of Egyptian and Assyrian Antiquities, I learned recently that the tablet in question was almost certainly the one numbered K90, discussed by Hincks, and Bosanquet and Sayce, and referred to by more than one historian of mathematics. Mr. Gadd drew my attention also to an important discussion of this tablet by F. X. Kugler, in his "Sternkunde und Sterndienst in Babel," 2. Buch, 1. Teil, 1909, pp. 45–50. The views of Hincks rather than those of Bosanquet and Sayce are here upheld. In this connection Kugler refers to an article by Schiaparelli in *Scientia,* vol. 3, 1908; this is also in Schiaparelli "Scritti sulla Storia della Astronomia Antica," vol. 1, 1925, see especially page 23.

In the paragraph just before the last of my address I summarized, in about a dozen lines, some of the astronomical knowledge of the Babylonians. My friend Professor Cajori inquired if I intentionally omitted any reference to the Babylonian discovery of the precession of the equinoxes. This was a discovery of about 350 B. C. and hence should hardly be included in a survey of "Mathematics before the Greeks." It is, of course, a matter of great interest, and in my recently published "Bibliography of Egyptian and Babylonian Mathematics" I refer to Schnabel's important paper on the subject (1927) as well as to Professor Cajori's review of it in SCIENCE.[3] Schnabel's article seems to have been developed from a part of Kugler's work, mentioned above, published in 1924.

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USEFUL GREAT TOES

A NUMBER of years ago, in the Louvre Galleries, in Paris, an artist who was born without any arms was a familiar sight. He was painting copies in oil of the principal masterpieces in the gallery and made thereby a comfortable living. That fact shows that the copies were of good quality.

But every one would ask at once how *could* he copy these paintings in oil without any hands? It was done entirely by means of the, to us, useless great toes and their next neighbor, the second toes. He held the brushes between these toes.

One morning when I happened to be in the gallery at the usual hour for the *déjeuner à la fourchette,* I saw him just finishing his meal. He seized a pint bottle with the left toes and grasping the cork with the corresponding toes on the right foot uncorked the bottle, lifted it to his mouth and after drinking all that he wished replaced the cork with the right toes and then with the sole of the right foot gave it a smart tap to replace it firmly.

W. W. KEEN

SCIENTIFIC BOOKS

Revision of the American Chipmunks. By ARTHUR H. HOWELL. North American Fauna, No. 52. U. S. Department of Agriculture, Bureau of Biological Survey. November, 1929. 157 pp.

THE appearance of the "Revision of the American Chipmunks," long known to be in course of preparation, is a zoological event of importance. These animals, so attractive to every lover of nature, are of more than ordinary interest to students of evolution on account of the great number of local forms. Modern methods have made it possible to deal with the subject very thoroughly, no less than 14,554 specimens having been examined. Sixty-five species and subspecies are recognized in North America, including Mexico. There are chipmunks also in northern and northeastern Asia, and it is found that the whole series falls into three main groups, the Asiatic *Eutamias,* the western American *Neotamias* (defined

[1] SCIENCE, 71: 109, January 31, 1930.
[2] Vol. 2, p. 230.
[3] SCIENCE, 65: 184, February 18, 1927.

and named in the work reviewed) and the eastern American *Tamias*. The two latter overlap in the region around Lake Superior. Singularly enough, the Siberian *Eutamias* resembles in a number of characters the eastern American *Tamias;* so much so that Pallas in 1778 thought that the Siberian and American animals were mere forms of a single species. However, the dentition of *Tamias* is the most modified, the upper premolars being reduced to two, instead of four as in the other two groups. Howell treats *Tamias* and *Eutamias* as genera (following the current usage of modern authors), and *Neotamias* as a subgenus of the latter. The probable inference would seem to be that *Eutamias* represents most nearly the stem-form, having at an early date sent to America the ancestors of *Tamias,* and more recently those of *Eutamias,* which, being a livelier and more variable animal, supplanted *Tamias* in the west. This is at present mere guessing, but it may be that fossil *Tamias* will be found in the west some day.[1] The characters and distribution considered, there is perhaps some basis for considering *Neotamias* a genus (type *Neotamias merriami* Allen).

When we come to the species and subspecies, there is very much of interest. In *Tamias,* Howell recognizes one species with five subspecies. In *Eutamias* (*Neotamias*) he has sixteen species and sixty forms in all, including subspecies. The subspecies are found to intergrade and it is to be determined whether these intergradations are directly related to the environment or whether they are due to crossing between races which meet each other in some part of their range. That the environment affects the characters is shown by the repeated development of dark or richly colored animals in humid districts, and pallid ones in drier districts. An interesting case is that of *Eutamias minimus caryi,* which occurs only in the dry lowlands of the San Luis Valley, Colorado, while the mountains northward, eastward and westward are occupied by the larger and darker *E. minimus operarius.* At 8,200 feet specimens were found connecting these races. Reviewing the numerous cases of intergradation recorded, one is struck by the various combinations of characters, exactly as in the case of hybrids. It seems certain that we have to do with hybridization in the majority of instances, and this in itself need not necessarily indicate subspecific rather than specific rank. But in any case, the "subspecies" are closely allied, and their precise rank is a matter of minor importance.

Although the work has been so thoroughly done, the subject is by no means exhausted. There are still many localities where collecting is desirable, and additional forms may yet be found on isolated mountain ranges. Hybridization in captivity should be attempted. Many anatomical features have yet to be compared in the different forms, for example, the auditory ossicles, the alimentary canal, the musculature. Although it is outside the scope of Howell's revision, one would like to see a chapter on the internal and external parasites and the predatory enemies. The food habits are treated interestingly and quite fully by Howell, who also discusses nesting habits and hibernation. We are not quite sure that the chipmunks would approve of a picture of a weasel on the cover of the work.

The bulletin may be purchased for a trifle, but we wish the government would use better paper and type for such important papers of permanent value.

T. D. A. COCKERELL

BOULDER, COLORADO,
DECEMBER 21, 1929

[1] An extinct species, *Tamias nasutus* Brown, has been found in the Pleistocene of Arkansas.

SCIENTIFIC APPARATUS AND LABORATORY METHODS

A SIMPLE SPOT-PLATE TEST FOR NITRATE NITROGEN IN SOIL AND OTHER EXTRACTS

THE diphenylamin test, usually conducted as a "ring" test, gives purely qualitative results. The blue color that appears in the ring test is lost when the sulphuric acid reagent and the liquid to be tested are mixed together, since it occurs only in sulphuric acid concentrations of 70 to 90 per cent. There is a definite need for a quick and simple nitrate test for soil extracts, drainage waters, plant juices or plant extracts that gives approximate quantitative results. For instance, in the field of soil science, it is desirable to study the nitrate nitrogen content of the soil from day to day or from week to week during the growing season. Exact quantitative measurement by the phenyldisulphonic acid or Devarda's alloy methods is laborious and the delay involves a loss of valuable time before necessary corrective steps can be made, as is the case when the soil drops so low in nitrate nitrogen content as to fail to nourish the plant properly.

The author has applied the principle of the very sensitive diphenylamin color reaction to a spot-plate technique. The reagent is a freshly prepared solution of 0.05 gm of diphenylamin in 25 cc of concentrated C. P. sulphuric acid. This is conveniently used from a glass-stoppered bottle of clear glass. The writer has attempted to use amber glass contain-