ing such surveys possible. It is a step in a radically new direction to introduce the prosecution of investigation *per se;* and it should be well considered where this begins, and whether it is the proper function of the government to prosecute such work. The establishment of a teaching university is a still greater step.

There is further, in my opinion, no need of a university in Washington, as we already have as good an institution as could be wished at the neighboring city of Baltimore.

An appeal to the prestige of the names of the statesmen of the early days of the country is always to be deprecated. We are suffering at the present time from a law passed under the hurrah raised by a similar appeal. L. S.

Some points in the evolution of the horses.

The main facts with regard to the evolution of the horses have long been known, and the series of modifications in the limbs, skull, and molar teeth, so fully described, that little doubt remains as to the various links in the long chain. But, in tracing out the line of descent of any group of organisms, it is not only necessary to follow out the steps of progression in a general way, but in all their details. In the case of fossils, this must, for the most part, be done by many different observers, as so much depends upon the fortunate discovery of good specimens. The present note gives a small contribution of this kind to the elucidation of the history of the horses.

The earliest member of the series of which we know much is the Hyracotherium of Owen (Orohippus, Marsh). This little animal is quite abundant in the lower eocene of Wyoming, and has been very fully described by Professor Cope. In this genus (fig. 1) the incisors are arranged in a semicircle,

FIG. 1. — Lower incisor and canine series of Hyracotherium (after Cope). One-half natural size.

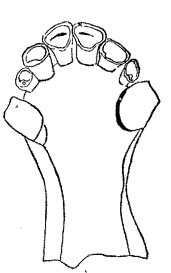

FIG. 2. — Lower incisor and canine series of Anchitherium (after Kowalewsky).

either uninterruptedly or separated by slight intervals. They are simple teeth, with sharp, chisel-shaped crowns. The canines are small, conical, and everted. The symphysis of the lower jaw is long and much contracted, rounded and somewhat expanded at the end.

The next type in the series is the Mesohippus of Professor Marsh, from the White River beds or lower miocene. Although the characters which Professor Marsh gives as separating this form from Anchitherium are either inaccurate or not of generic value, Mesohippus must, as we shall presently see, be regarded as a distinct genus. Here the shape of the mandibular symphysis and of the incisor teeth is very much as in Hyracotherium. The incisors are small, with rather broad, chisel-shaped crowns, and without a trace of an invagination of the enamel. The advance from Hyracotherium to Mesohippus consists chiefly in the increased size of the animal, reduction of the number of digits, greater complexity of the premolar and molar teeth, and enlargement of the brain. Specimens of Mesohippus with the incisors in position are rather rare. The description given above is of a small species (No. 10,246 of the Princeton museum) which was obtained by the Princeton scientific expedition of 1878 at Chalk Bluffs, Colorado.

In the upper miocene deposits of the Pacific coast the true Anchitherium (Miohippus, Marsh) appears. In this genus the incisors show an invagination of enamel on the grinding surface of the crown. The pit so formed is shallow, and comparatively soon wears down to a scar. I have not had an opportunity of examining European specimens with reference to this point, but the presence of the pit is clearly shown in Kowalewsky's figures (*Memoires de l'academie imper. de St. Petersbourg,* 7th ser. tome xx. pl. iii. figs. 55 and 57). Of fig. 57 (see fig. 2), Kowalewsky says, "Les incisives mitoyennes présentent déjà les puits en émail qui sont si charactéristiques pour les chevaux." This pit, seen in its earliest stages in Anchitherium, goes on increasing until it reaches its greatest development in the recent genus Equus. It is of interest to see that even in this small and comparatively unimportant detail we find a fresh confirmation of the accuracy of previously expressed views as to the series of equine ancestors. If these determinations are accurate, they must, of course, hold good down to the minutest details. Further investigation will undoubtedly bring more of these minor correspondences to light. W. B. SCOTT.

Geol. mus., Princeton, N.J., Dec. 16.

Equatorial currents in star and planetary atmospheres.

In the 'Astronomical notes' contained in the number of *Science* for Dec. 11, occurs a statement in regard to the circulation of the earth's atmosphere which seems to me to require qualification, and I therefore venture to call your attention to it. The passage in question reads as follows: "As to the earth, we know that the general drift of the lower atmospheric currents is eastward, rotating faster than the globe itself; but of the circulation high up above the clouds we knew absolutely nothing until the red sunsets following the Krakatoa outburst . . . indicated, by their successive appearances at different places, a probable upper equatorial current moving rapidly westward, i.e., rotating slower than the earth."

Now, it is well known that the eastward movement of the atmosphere is confined to the temperate zones, and is not observable in the polar or tropical regions. On the contrary, the most striking feature in the circulation of the atmospheres is the great equatorial wind-current which flows from *east to west* along the equator, and is felt beyond the tropics of Capricorn and Cancer. It is about 60° in width, and therefore covers one-half the earth's surface. It is also, as I believe, the most important factor in the whole system of oceanic and atmospheric circulation, since, by the friction of its movement over the ocean surface, it produces the great equatorial water-current which is the chief, though not the only, cause of all the great movements of oceanic waters. The