The phylogeny of the marsupials is as yet closely surrounded by many doubts, which, however, paleontology is slowly but surely clearing away. It is probable that the earliest mammalian remains so far discovered are marsupial; that is to say, so far as brain and reproductive development are concerned. It is highly probable, also, that the relation between the marsupials and the still lower organized monotremes is a comparatively near one, although, as Marsh says, "we have as yet no hint of the path by which these two groups became separated from the inferior vertebrates." That they did become separated, and that the marsupials at least inherited the characters, more or less modified, which marked their reptilian ancestors, among which may be enumerated the entire absence or incomplete condition of a rotula or patella, there is much reason to suppose. D. D. SLADE.

Cambridge, Mass., July 17.

One of Dr. Hann's Teachings.

HOWEVER much or little the Sonnblick temperature observations of Dr. Julius Hann are going to teach us about the nature and cause of cyclones, I think we may at least profit by the example which he affords us, in the spirit with which he has conducted his discussions of meteorological topics with those who differed from him. In the valuable papers which Professor Abbe translated for the "Smithsonian Report of 1877," Dr. Hann has frequent occasion to reply to his critics, Capt. Hoffmeyer, Reye, and others; and he does so not only in a tone of courtesy, such as a true gentleman would naturally employ, but also with an evident desire, in the interests of science, and quite regardless of personal pride in his own consistency, to reconcile conflicting views as far as possible. Is not this the best way in which to ascertain and establish the truth? RESEARCH.

The Aurora.

IN the course of an extended research in regard to the relation of the aurora to magnetic and solar conditions, in which I have been engaged for several years, the question as to whether atmospheric movements are affected has been considered. Incidentally the matter of tornadoes, touched upon by Professor Hazen in the last of his articles upon that subject thus far published, has been taken into the account. As his table on p. 30 of *Science* for July 18 appears to indicate, at least for the years for which the more complete reports are to be had, a relation of some sort to a disturbed condition of the sun appears to exist. His method of attempting to show in detail the "specific influence of spots" is not, however, quite complete. For instance: the glowing eruptions known as the *faculæ* are far more intimately related to magnetic storms, and presumably other phenomena, than are the spots. It is not my purpose to enter upon the discussion in detail at present. Tables are in existence, and in process of verification, which may one day be published if found complete after searching tests to which they are being submitted. Enough has been learned to warrant the positive affirmation that this subject has not yet been exhausted. Certainly there is room for improvement in knowledge of the causes of sudden intensification of storm energy. M. A. VEEDER.

Lyons, N.Y., July 21.

BOOK-REVIEWS.

Contributions to American Educational History, Nos. 8 and 9. Ed. by HERBERT B. ADAMS. Washington, Bureau of Education. 8°.

THE first of these pamphlets is a "History of Education in Alabama," by Willis G. Clark, and is mainly devoted to the University of Alabama and other collegiate institutions. The history of the State University is recounted at tedious length, and with a particularity out of all proportion to its importance. The other institutions, both colleges and academies, are more briefly dealt with, while the public schools are dismissed with a very short notice indeed. The system of public education is of very recent growth; and even now, as Mr. Clark states, the schoolhouses are altogether insufficient to accommodate the pupils. What the real quality of the various schools is, it is impossible from this pamphlet to clearly make out. In treating of the University of Alabama, for instance, Mr. Clark has a great deal to say about the finances of the institution, the lives of the various professors, the quarrels between professors and students, and other matters of minor importance; but what the course of study there actually is, how strictly it is pursued, and how the education furnished there compares with that given by other universities, Mr. Clark does not sufficiently inform us. Yet these are just the things that readers most wish to know. As far as it goes, however, his work seems to have been carefully and conscientiously done.

The other pamphlet in our hands is "The History of Federal and State Aid to Higher Education in the United States," by Frank W. Blackmar. It begins by recounting what the general government has done in this direction, partly by land grants to the States for educational purposes, and partly by the establishment and maintenance of the Smithsonian Institution, the Naval and Military Academies, the Library of Congress, and other institutions of an educational character. Then, taking up the States in detail, it shows what each of them has done in founding and maintaining colleges and universities, and also agricultural and technical schools. Mr. Blackmar has used much care and diligence in collecting his facts, and his work will be useful for reference; but it cannot be called a readable book. It is, in short, a mere catalogue of facts, set forth in a dry and technical style; and it does seem as if the subject might have been treated in a more interesting manner.

Reflections on the Motive Power of Heat and on Machines fitted to develop that Power. By N. L. S. CARNOT. Tr. by R. H. Thurston. New York, Wiley. 12°. $2.

BOTH publisher and author, in the case of this book, disclaim any expectation of reaping large pecuniary reward. Yet there are many reasons why this first English translation of a scientific work, that lay buried and unknown for many years till Sir W. Thomson chanced on it, and found in it the true explanation of the mode of working of the steam-engine, should have a place in every library where such epoch-marking books are to be expected.

The Carnot whose contributions to physical science are made public in this volume was born in the smaller palace of Luxembourg, June 1, 1796. His father was prominent in the political life of France during the close of the last century, and his grandnephew of the same name — Sadi Carnot — is now president of the French republic. He early manifested an interest in mechanics, which induced his father to give a scientific bent to his son's education. Naturally, in the absence of the polytechnic schools of the present day, this education was obtained in the military schools. As a result, Sadi Carnot, at the age of twenty-three, found himself in Paris on a long furlough, which gave him the leisure and opportunities for study which he had earnestly desired.

He diligently followed the course of the College of France and of the Sorbonne, of the École des Mines, of the Museum, and of the Bibliothèque. His interest in mechanics led him to the workshops, and in the fine arts to the study of painting and music.

In 1826 a return to active military duties was necessitated; but two years later, Sadi Carnot laid aside his uniform, that he might be free.

It was before this time, in 1824, that the paper on the motive power of heat was published. He had noticed how little advance had been made in steam-engines, and that such advances as were accomplished had come largely as the result of accident. It must be remembered that at that time the conservation of energy was unknown. This Carnot first suspected and then established, so far as the conversion of heat into work was concerned. Yet the scientific atmosphere of his time was so saturated with the idea that heat was material, that he made no use of this conversion of heat into work in his typical heat-engine, now so well known as Carnot's engine. He allowed the prevailing errors to dominate him in this wonderful elucidation of the essentials of an engine that shall give work for heat. Not only did he show the necessity of having a hot body and a cold body for the working of a