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

heat-engine, but he showed the limitations to the efficiency of such an engine. and the directions in which improvement might be looked for. As a result, we have the triple-expansion engines of the ocean greyhounds.

But all this work was far in advance of the thought of his time, and was destined to remain unappreciated for years after the author's death, which took place Aug. 24, 1832.

AMONG THE PUBLISHERS.

A TIMELY article on "A Tornado's Power," by William A. Eddy, in *Harper's Weekly* for July 26, gives a vivid description of the destructive tornado of July 13, near St. Paul, Minn. The article is accompanied by four illustrations.

— In an article in the August *Lippincott*, on "Milk-Legislation," R. M. Elfreth presents the European legislative methods for preserving the purity of this important article of diet, and suggests to our own legislators certain wise provisions. Charles Morris contributes a sketch of the Philadelphia Academy of Natural Sciences.

— Mr. Edward Atkinson is to publish in *The Popular Science Monthly* for August and September two extended and important articles on the revision of the tariff, under the title "Common Sense applied to the Tariff Question." Like other articles in the field of political science which appear in the monthly, these papers will discuss the subject with a refreshing disregard of partisan advantage. In the first of these, which will open the August number, he shows the incompetence of American legislators and government officers in dealing with financial questions, and, without taking extreme ground, goes on to point out weighty business considerations which should determine the direction of tariff reform.

— A dozen articles are included in the *Westminster Review* for July, issued in this country, by authority of the English publishers, by the Leonard Scott Publication Company, New York. A. Amy Bulley writes on "The Political Evolution of Women;" James W. Davis discusses the Sunday opening of public libraries, art-galleries, and museums; William Trant writes on "Prairie Philosophy," presenting a picture of social and daily life in the great Canadian North-west; Professor Andrew Gray writes on "Technical Education in Wales;" R. Seymour Long reviews the civil struggle in England in the seventeenth century, in a paper entitled "The Case for the Commonwealth;" E. F. Hannigan contributes an essay on "Genius and Moral Responsibility;" Janet E. Runtz Rees relates the experience of a bread-winner in an article on "Wage Value in America;" G. S. Godkin writes on "Old Italy *versus* Young Italy;" Theal's "History of South Africa," and some of the most important of recent novels, are reviewed; an anonymous writer discusses the rights of labor; and the usual monthly review of home affairs treats of the latest developments in English political life.

— Edward Marston, the veteran London publisher, writing in the August *Scribner* about "How Stanley wrote his Book," gives the following particulars of the materials from which it was made: "Mr. Stanley's memory of names, persons, and events, is quite marvellous, but in the compilation of his book he by no means trusted to his memory. His constant habit was to carry a small note-book, six by three inches, in his side-pocket. In this he pencilled notes constantly and at every resting-place. Of these note-books he has shown me six, of about one hundred pages each, closely packed with pencil memoranda. These notes, at times of longer leisure, were expanded into six larger volumes, of about two hundred pages each, of very minute and clear writing in ink. In addition to these field note-books and diaries, there are two large quarto volumes, filled from cover to cover with calculations of astronomical observations," etc. He also tells this story of Stanley while at work on his great book: "Sali, the black boy who travelled with him throughout his long and perilous expedition, is a youth of some resource. Until this terrible book had got into his master's brain, he had been accustomed to free access to him at all hours; but now things were different. Every time he approached the den, the least thing he expected was that the ink-stand would be thrown at his head. He no longer ventured therein. One day he originated a new way of saving his head: he had a telegram to deliver, so he ingeniously fixed it on the end of a long bamboo, and, getting the door just ajar, he poked it into the room, and bolted."

— A copiously illustrated account of the missions and mission Indians of California will be contributed to the August *Popular Science Monthly* by Henry W. Henshaw. He represents the rule of the priests as more conducive to the numerical growth of the Church and the profit of the missions than to the welfare of the Indians. A picture of Ramona and her children standing at the door of her hut is one of the illustrations. Mr. Bernard Hollander of London will contribute to the same number an illustrated paper on "Centres of Ideation in the Brain." It will show how the experiments of modern physiologists support some of the observations of the early phrenologists, though by no means indorsing all that the name "phrenology" implies. There will also be an article on "Ancient and Modern Ideas of Hell," by Frederik A. Fernald. It will doubtless prove very seasonable just now, when the air is full of the proposed revision of certain Presbyterian doctrines. Other articles are "Thunder-Storms," by Robert H. Scott; "A Queer Pet," by Miss E. W. Bellamy; and "The Uses of Animal Color," by Edward B. Poulton.

—The last two issues of the American Historical Association contain some papers of interest. The January number is partly occupied by the secretary's report and the list of members, which show the society to be in a flourishing condition, the number of members having increased, since the formation of the society six years ago, from forty to six hundred and twenty. The same number contains a paper by President Adams of Cornell, on "Recent Historical Work in the Colleges and Universities of Europe and America," which shows clearly, that, notwithstanding the improvements of the last few years, we are still in the rear of other nations in this department of study. It seems to us, however, that President Adams overrates the usefulness of the German seminary courses, which are mainly devoted to the mere study of facts; and that what we need are courses like those at Oxford and Cambridge, in which special attention is given to the formation of a true historical judgment as to the significance of events. The study of historical facts is very simple, as is proved by the ease with which young men learn it; but the formation of a judgment that can properly interpret history requires a far more elaborate culture, and ought, therefore, to be the chief object of attention. The April number of the association's papers is entirely devoted to a sketch of the origin of the national scientific and educational institutions of the United States, written by Dr. G. Brown Goode of the Smithsonian Institution. The author begins with an account of the formation of the American Philosophical Society at Philadelphia in 1769 and the American Academy of Arts and Sciences at Boston in 1780, both of which are still in existence. He then recounts the efforts of Washington, Joel Barlow, and others, to found a national university at the national capital,—efforts that have often been renewed since, though as yet without success. Special attention is given to the organization of the Coast and Geological Surveys, and some account is given of the earliest exploring expeditions. The foundation of the Smithsonian Institution is of course described, and particular attention is devoted to the organization and development of the weather service. Dr. Goode writes with an enthusiasm that makes his paper interesting, and we commend it especially to scientific readers. The papers of the association are published quarterly at one dollar each, by G. P. Putnam's Sons, New York.

— The American Academy of Political and Social Science was organized last December in Philadelphia, and now gives to the public the first number of its *Annals*. We wish we could say that the papers contained in it are superior to others on similar subjects that have appeared elsewhere; but they have the same superficiality that characterizes so much of American thought and scholarship. The best paper in the number is the opening one, by J. G. Bourinot, on "Canada and the United States." The author compares the government of his own country with ours, and, while admitting the superiority of ours on some points, shows