

Although handsome specimens of these cycad, or Bennettitalean trunks were found in this country between Baltimore and Washington as early as 1851, they were not observed to present any new structural details, and remained, as in Europe, among the rarest of fossils until the discovery in quick succession some ten years ago of numerous additional Maryland specimens, and the first of the highly important new localities in the Black Hills and Wyoming. At this time superb trunks from the Black Hills were obtained by the Smithsonian Institution, while still others of importance were collected by Professor Macbride, of the Museum of the State University of Iowa. In the meantime Professor Marsh became deeply interested, and with remarkable foresight and success secured for the Museum of Yale University the most extensive and valuable of all cycad collections. Yet another interesting series of trunks is that from central Wyoming belonging to the State University at Laramie.

The macroscopic study of the American material has been carried on by Professor Lester F. Ward, and its structural investigation by the writer.

The preliminary studies of the latter thus far published include in part the discovery of the leaves with their structure and prefoliation, additional facts concerning ovulate fructification, and, of most importance, the form, prefloration and principal structures of the bisporangiate strobili. These, like the ovulate cones, owe their marvelously perfect preservation, in large measure, to their protected position among the old leaf bases. They are found unexpanded, but quite mature and complete in every detail. Moreover, the features present indicate with exactness the appearance that must have been presented in life by the strikingly handsome expanded flower or strobilus, which was in some species nearly, or even one foot in diameter.

The microsporophylls, or staminate fronds, bear pollen in sori of a structure identically comparable with those of the tree ferns of the genus *Marattia*, and are the first of their type yet discovered. Their interest from an evolutionary point of view is, therefore, very

great, furnishing as they do the most direct evidence yet brought to light of the derivation of the Gymnosperms from ancient Marattiacean Pteridophytes bearing asexual spores. But, at the same time, the plan and other characters of the entire strobilus suggest much as to the possible manner and method of the evolution of the Angiosperms. In addition, these studies have already brought about a better understanding of the true character of various related but hitherto problematical fossil casts and impressions.

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YALE UNIVERSITY MUSEUM,
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CURRENT NOTES ON METEOROLOGY.

SCIENTIFIC INVESTIGATIONS BY WEATHER BUREAU
MEN.

ONE of the most noticeable, and one of the most satisfactory, signs of the development of the United States Weather Bureau is the steady increase in the amount, and the no less steady improvement in the quality, of the original scientific investigations carried on by the rank and file of the Weather Bureau officials and observers. This encouraging advance is due largely to the energy and enthusiasm of the present Chief of the Weather Bureau, and of the more prominent officials of the service, notably Professors Abbe, Bigelow, Marvin, Henry and others. The two annual 'Conventions of Weather Bureau Officials' have doubtless also helped much towards this same end, for at these meetings there is opportunity for the reading of papers, for discussions, and for the promotion of a feeling of fellowship and of a spirit of scientific ambition which are most desirable. The *Proceedings* of the second annual convention of the officials of the Weather Bureau (Bulletin No. 81) is a volume containing a large amount of information of interest to every one who is working along meteorological lines, but the most striking feature of it, in the mind of the present writer, is the evidence it gives of original investigations carried on by Weather Bureau men. Space forbids any attempt at a review of this 'Bulletin.' Indeed, a mere enumeration of the titles of the papers read

at the Convention would occupy a column or two of SCIENCE.

CYCLES OF PRECIPITATION IN THE UNITED STATES.

IN the *Monthly Weather Review* for October, Mr. L. H. Murdoch, Section Director of the Weather Bureau at Salt Lake City, considers the cycles of precipitation at that station and at other places. He finds for Salt Lake City a dry cycle between 1827 and 1864, during which the average annual rainfall was about 15 inches; a wet cycle from 1865 to 1886, with an average annual precipitation of 18.42 inches, and from 1887 to the present time a dry cycle, the average annual precipitation from 1887 to 1901 being 15 inches. From the records for San Francisco, Sacramento, Denver, Omaha, St. Louis, Cincinnati and Baltimore it appears that the country west of the Rocky Mountains had its wettest cycle from 1866 to 1887, while the middle Mississippi and Ohio valleys received their heaviest precipitation from 1840 to 1859. The present dry cycle is general from San Francisco to Baltimore. Mr. Murdoch finds no relation between his rainfall curves and Wolfer's sunspot tables, and concludes 'that there is no known natural law by which we can predict the length of the present dry cycle.'

The rainfalls for certain stations in the United States, it may be recalled, have lately been studied by Brückner, who finds that they correspond very well with his thirty-five-year climatic period. Mr. Murdoch makes no reference to Brückner's work along these lines.

R. DEC. WARD.

CURRENT NOTES ON PHYSIOGRAPHY.

ABANDONED CHANNELS OF THE MONONGAHELA.

THE Masontown-Uniontown folio of the Geologic Atlas of the United States by Campbell describes a part of the Alleghany plateau in southwestern Pennsylvania. The higher plateau, east of Chestnut-Laurel ridge, is referred with some doubt to a much wasted stage of the uplifted Cretaceous peneplain of the Appalachian province; the lower uplands, further west, represent an Eocene peneplain, now maturely dissected. The chief river is the Monongahela, whose curving valley had

been already well graded and opened by early glacial times; since then the river has cut a narrow trench 150 feet below its former valley floor. The trench is still so young that only slender discontinuous strips of flood plain are developed along it, on the inner side of curves; while the larger side streams enter the main valley with a strong slope, and still preserve the open flood plains of the earlier cycle in their middle course. But the most peculiar features of the district are the abandoned channels of the Monongahela at the level of the open valley floor. These are not normally cut-off, round-about channels, like those of the Meuse and Moselle, abandoned by wearing through the necks of the spurs that the river once contoured; for the new courses of the Monongahela are cut through broad, stout spurs for distances of a mile or more. Moreover, the abandoned channels are much clogged with silt, sand and gravel, with some boulders, to depths of 100 feet. Features of this kind are known in connection with several other north-flowing rivers not far south of the glaciated area, the most noted example being the heavily silted Teay valley, from which the Kanawha has turned northward to the Ohio. Campbell suggests that the new courses were taken when the old valleys were locally obstructed at various points by ice dams during the Kansan glacial epoch; each dam is supposed to have gained such strength that it endured for many years, and such height that it surmounted the level of some saddle among the hills on one or the other side of the main valley. Then silts and gravels were deposited in the ponded part of the river, while the new channel was incised in the saddle of overflow. The uplift by which the deepening of the new valleys below the older ones was brought about is dated as post-Kansan.

The hypothesis of local ice-dams, begun during the spring floods of frozen rivers and strengthened on account of the more severe climate of the early glacial epoch, seems at first reading hazardous from the number, height and duration of the dams required. The number of examples is, however, more in favor of the hypothesis than against it: if