somewhat unsatisfactory method of pyrometry. Incidentally it may be appropriate (as for instance in the case of Violle's famous experiments) but it now has little general laboratory value.

The resistance pyrometer, introduced by Siemans and perfected by Callendar and Griffiths, is for shorter ranges of high temperature (0°–1000°) now without a rival in accuracy. It has the additional advantage of continuous registry almost as far down as the absolute zero of temperature. Calibrated with reference to Callendar's equations by aid of the specially determined boiling point of sulphur (an error was detected in Regnault's value by this very instrument), it is also a convenient instrument in practice.

The chapter on thermoelectric pyrometry, in which Le Chatelier is specially interested is naturally very full, at least in relation to the D'Arsonval method of measurement. This is obviously the more practical though the zero methods give a permanent record. Figures are abundantly inserted of the galvanometers, furnaces, crucibles, and the other necessary paraphernalia of the pyrometric laboratory.

The chapter on radiation pyrometry is antiquated and meagre, inasmuch as nothing is said about the remarkable results of Wien, Lummer, Kurlbaum, not to mention Planck and others who are remodeling the whole subject. So also the mention made of the bolometer is altogether inadequate. On the other hand Le Chatelier enters at length into photometric radiation pyrometry which is of secondary interest by comparison.

The final chapters contain interesting information on Wedgewood pyrometry and on Seeger cones, recipes being given in detail. The book closes with the remarkable work which Roberts-Austen is now doing with his self-registering pyrometer and the new differential method of observation.

The book as a whole is obviously an outgrowth of the laboratory and is supplemented by personal observation. As such it needs no further recommendation.

C. BARUS.

BROWN UNIVERSITY,
PROVIDENCE, R.I.

SOCIETIES AND ACADEMIES.

GEOLOGICAL SOCIETY OF WASHINGTON.

THE 99th regular meeting was held at the Cosmos Club, March 14, 1900.

Under informal communications, Mr. J. A. Taff exhibited some asphalts from Indian Territory, and briefly described their occurrence.

On the regular program the following papers were presented:

(1) 'Glacial Sculpture in the Bighorn Mountains,' by Mr. F. E. Matthes.

The glacial cirques on the Bighorn Range are exceptionally well preserved and complete in outline. The crests and spurs separating them have remained unglaciated, and are remnants of pre-glacial topography. The cirques do not necessarily develop at the heads of the pre-glacial alpine valleys. In numerous cases the upper ends of the latter have remained unglaciated while cirques have formed lower down. This raises the question: What are the conditions necessary for the formation of a cirque; or, since a cirque is essentially the product of frost-action in the bergschrund, what determines the location of the bergschrund?

It was shown that the unglaciated areas above the bergschrunds were covered by *quiescent névé* during the period of glaciation. They were *nivated*. The effects of *nivation* are the accentuation of abrupt slopes and the effacing of the pre-glacial drainage lines by deposits of powdered rock produced by frost-fracturing along the edges of the névé sheets. The bergschrunds constitute the boundary between the *nivated* and *glaciated* areas.

According to the evidences gathered in the Bighorn Mountains the location of the boundary line is intimately connected with the depth of the valleys, or, more strictly, with the depth of the névé. That the spheroid of the mean annual temperature of 32° F. does not influence its location is demonstrated by the fact that cirques and nivated areas exist side by side at all elevations from 10,000 feet up to 13,000 feet.

The conclusion is that névé may remain stationary or acquire motion at any of these elevations, regardless of the altitude of the spheroid of 32° F. The only factor which determines whether a body of névé shall have motion or not is its depth.

(2) 'Physiography of the Arkansas Valley Region,' by Mr. Geo. I. Adams.

This is essentially a gradation plain, below which lie the present stream valleys, and above which rise numerous residual hills, ridges, mesas and mountains, to elevations usually not greater than 200 feet. The mountains which occupy the broader synclines, however, may rise from 1500 to 2300 feet above sea-level. The rocks have been thrown into open folds, with east and west trend. There is little faulting. The northern limit of the region is the Boston Mountains, having a monoclinal structure and forming the southern edge of the Ozark Plateau. To the south it is limited by the closely folded and faulted structure of the Ouachita Mountains.

The Arkansas Valley Region may be considered as an extension of the Prairie Plains eastward through the mountains of Indian Territory and Arkansas to the Gulf Plains. It shows evidence of an earlier erosion period in which the streams flowed at relatively higher levels. It may be compared with the Appalachian Valley region in its structural and physiographical relations.

F. L. Ransome,
David White,
Secretaries.

BIOLOGICAL SOCIETY OF WASHINGTON.

The 320th meeting, held on Saturday, March 10th, was devoted to an address by Dean C. Worcester on 'The Birds and Mammals of the Philippines' which was illustrated by lantern slides. The speaker dwelt particularly upon the distribution of the birds, showing the part played by deep straits as barriers to migration between the islands, and stating that the Bornean aspect of the fauna was confined to Palawan and the adjacent small islands. The difficulties of collecting in the Philippines were described, but it was pointed out that these islands offer exceptional opportunities for the zoologist and that a careful study of the fauna might be expected to throw much light on the problems of specific and individual variation.

F. A. Lucas.

NEW YORK ACADEMY OF SCIENCES.

SECTION OF ANTHROPOLOGY AND PSYCHOLOGY.

The regular meeting of the Section was held on Friday, February 23d. The first paper of the evening, entitled 'Symbolism of the Huichol Indians,' was presented by Carl Lumholtz. The Huichols are a small tribe of about 4000 souls living in the southwestern part of Mexico, on a spur of the Sierra Madre. Their country being difficult of access, they have been left comparatively untouched by civilization, and thus preserved their ancient beliefs and customs intact to the present day. The paraphernalia of the warrior of ancient times, *i. e.*, of the gods of the present race, furnish the principal symbolic objects by which prayers are expressed, and the most important of these articles is the ceremonial arrow left as a sacrificial offering in the temples and considered a carrier of prayers. It is painted and otherwise decorated with symbolic emblems, and attached to it are representations of other paraphernalia of the warrior, as the front-shield and the back-shield, the latter being also viewed as the mat or bed of the god. Frequently the object of the prayer is incorporated in an attachment to the arrow. The vivid imagination of the people makes them see analogies in the most heterogeneous phenomena. They see serpents in the sky, the clouds moving through space, the wind sweeping over the fields, the rain falling down, even in their girdles and ribbons. Certain insects which appear during the wet season are identical with corn, and corn is identical with hikuli, and hikuli identical with deer. The same tendency to consider heterogeneous objects as identical may be observed in the fact that a great variety of objects are considered as plumes. Clouds, cotton-wool, the white tail of the deer, the deer's antlers, and even the deer itself are plumes, and the serpents are believed to have plumes. Naturally, much ambiguity is found, and there are few symbols that express always the same meaning; nor is an idea always expressed by the same symbol. Although this gives a certain individuality to the symbolic objects, we can always trace the connection between the thought to be expressed and the symbol expressing it. The second paper on 'Symbolism of the Arapahoe Indians' was read by A. L. Kroeber. It was shown with the aid of lantern slides that the decorative art of the Arapahoe Indians is throughout realistic (*i. e.*, pictorial) or symbolic.

Geometric patterns occur, but rarely, and the general character of the art is suggestive rather of pictography. Symbols representing animal life, physical nature, and abstract ideas predominate.

Dr. Franz Boas presented a paper on 'The Growth of Children.' A series of measurements of children repeated at annual intervals proves that the variations of growth must be interpreted as mainly due to acceleration and retardation of growth, combined with hereditary influences, which determine the amount of annual growth. It was shown that it is possible to determine the essential elements which determine the amount of annual growth by admission of regulated measurements. These result in a determination of (1) the relation between final development and development at any given period; (2) the typical development at a given period; and (3) the variability of the series in regard to period.

CHARLES H. JUDD,
Secretary.

ZOOLOGICAL CLUB, UNIVERSITY OF CHICAGO.

AT the meeting of January 10th, Mr. R. H. Johnson presented a paper prepared in collaboration with Mr. R. W. Hall, entitled 'Variation in *Palaemonetes* correlated with Salinity.' After calling attention to the fact that our marine species of *Palaemonetes* differ from the fresh-water form in presenting a greater number of rostral teeth, Mr. Johnson stated that various lots of the marine species which were collected in brackish water show an intermediate condition as regards the rostral teeth. A complete series of intermediate forms exists and the natural inference is that the different degrees of salinity cause the observed differences in form. The experiment of rearing the animals in media of different degrees of salinity has not yet been made by the authors, but will be attempted, as this alone will afford complete evidence in regard to the matter.

The second paper of the meeting was a review by Mr. A. N. Young of several recent papers, by Edmond Bordage, on regeneration in insects.

The second meeting of the month was held on January 31st. The first paper of the session 'A Review of Bresslau's paper on the Development of the Rhabdocoels,' was presented by Mr. E. H. Harper.

The remainder of the session was occupied by an exhibition of a very interesting series of the extremely variable land snail *Pyramidula strigosa* Gould, collected by Hemphill from the Great Basin, a loan from the Powell Museum of the Illinois Wesleyan University through the kindness of Professor J. C. Hartzell. Attention was called to the direction taken by some of the variations. The recorded localities seem to indicate that some of the varieties are quite local in their distribution and that there is distinct geographical isolation. It was suggested that the history of the topography might throw light upon this isolation. Gilbert's map of 'Lake Bonneville' shows that the Oquirrh Mountains (the locality for the *Oquirrhensis* and *Utahensis*) were then situated upon a narrow peninsula. Climate may have since aided in preserving this isolation. This species is of special interest to students of evolution and well deserves to be better and more widely known.

C. M. CHILD.

THE ACADEMY OF SCIENCE OF ST. LOUIS.

AT the meeting of the Academy of Science of St. Louis on the evening of February 19, 1900, 43 persons were present. Professor Patrick Geddes, of University College, Dundee, in an address of about an hour, traced the increasingly complex relation of the world to science and the rapidly increasing need of co-ordination of the sciences, and then gave a concise account of the purposes which it is hoped to realize and the methods to be adopted by the International Association for the Advancement of Science, Art and Education, which grew out of the meetings of the British and French Associations for the Advancement of Science last autumn, and is to hold its first international assembly at the Paris Exposition in the course of the present year, the purpose of the Association, recognizing the wealth of instructive material brought together by the great transient museums, the World's Fairs, being the fullest possible utilization of the educational facilities so brought together.

On the conclusion of Professor Geddes' address, Hon. D. R. Francis, on the call of the President, spoke briefly on the subject presented by Professor Geddes, expressing a warm interest in the work of the Association, the cooperation of which with the Louisiana Purchase Exposition being planned for St. Louis, a few years hence, is hoped for.

A paper by Dr. G. A. Miller, 'On the primitive substitution groups of degree ten,' was presented by title.

Professor J. L. Van Ornum, late of the United States Engineer Corps, spoke interestingly on 'The sanitary cleaning of a city, as exemplified by Cienfuegos, Cuba,' explaining the conditions found by the United States Army on taking possession of that city, and the thoroughness with which the streets, court yards and cesspools were cleansed by the Engineer Corps, which also charged itself with the betterment of the city water supply. A diagram which the speaker had prepared showed that in addition to a very marked lowering of the death rate which attended the supply of an abundance of wholesome food, on the occupation of Cienfuegos, there had been a decrease of considerably over fifty per cent. in the weekly death rate, directly attributable to the sanitary cleansing of the city; and he further stated that since this work had been done, yellow fever, which before that time had been endemic in Cienfuegos, had been absent from the city.

Five persons were elected to active membership in the Academy.

William Trelease,
Recording Secretary.

DISCUSSION AND CORRESPONDENCE.

'FLOATING SAND.' 'FLOATING STONES.'

In the *American Geologist* for January, 1896 (Vol. XVII, pp. 29–37) I published an article on 'Floating Sand: an Unusual Mode of River Transportation' in which I gave a detailed account of that phenomenon as seen by me during the preceding August on the Llano river, a tributary of the Colorado, at Bessemer, a station on the Austin and Northwestern Railroad, 94 miles from Austin, Texas. I further gave an account of numerous experiments performed for the purpose of ascertaining how sand may be floated, what sand will float, and why sand will float. No less than fourteen different sands were examined some of which were from widely separated localities, as, for instance, the coast of Long Island and that of Lake Michigan, at Chicago; from the friable sandstone at Alum Bay, Isle of Wight, and the Lower Carboniferous at Pea Ridge, Arkansas. At the time of writing, I may add, the only account of floating sand known to me was in a brief article 'On a Peculiar Method of Sand-Transportation by Rivers' published by Mr. James C. Graham in the *American Journal of Science*, III, Vol. XL, p. 470 (December, 1890) and this I had failed to notice until I had begun my investigations.

Without going into the details of my paper further at this point, I will enumerate the conclusions reached which were as follows:

"1. That sand grains will float in perfectly still water for an indefinite time.

"2. That the grains which float are not necessarily siliceous. That flakes of mica, fragments of marble, bituminous shale, etc., also float and that some of them, the marble and the bituminous shale, for example, are unusually buoyant.

"3. That the property of floating is not confined to the sand of any particular locality, but depends to a considerable extent upon the angularity, *i. e.*, the shape of the grains.

"4. That whether sand will float or not depends, also, upon the mode of launching. Whether it be by ripple waves, as stated by Mr. Graham, or by undermining, it must be gently done, for should the grains be plunged into the water with sufficient force to completely immerse them they will immediately sink.

"5. That the natural conditions necessary to the floating of sand in rivers are somewhat unusual, depending, in the case of the Llano, upon a flood without local rains and, in that of the Connecticut, upon the manner in which certain waves strike a sand-bar. It is quite possible, however, that floating sand is much more common than is ordinarily supposed.

"6. That the physical explanation of the problem is complex rather than simple, and at best unsatisfactory in several important particulars, and that with the advance of molecular physics we may hope for a better understanding of what we now, for convenience, term 'superficial viscosity' and 'capillary attraction.'"