*Bird Lore* for March–April has the story of 'A Sierra Nighthawk Family,' by Florence M. Bailey, and of 'A Family of Barn Owls,' by Thomas H. Jackson; an important brief article on 'The Heath Hen in New Jersey.' Anna Head describes the 'Nesting of the Ruby-crowned Kinglet' and Frank M. Chapman gives the third paper on 'How to Study Birds,' this being devoted to the nesting season. There is the third series of portraits of *Bird Lore's* Advisory Councilors. There are the customary notes, reviews and reports of the Audubon Societies, from which we learn of the spread of bird protection in various states.

## *SOCIETIES AND ACADEMIES.*

### PHILOSOPHICAL SOCIETY OF WASHINGTON.

The 567th meeting was held on April 11, 1903. Professor Marvin exhibited a seismograph sheet showing a slight earthquake wave on March 15. Professor Gore described the 'International Bibliography of Mathematics' now published at irregular intervals in card form. Thus far eleven sets of one hundred cards each have been published.

Professor T. J. J. See, U. S. Navy, read a 'Historical Sketch of Olaus Roemer, the Discoverer of the Velocity of Light.' Roemer was one of the greatest scientific geniuses, ranking with Aristarchus of Samos, Archimedes and Hipparchus, among the ancients, and with Galileo, Newton and Bessel, among the moderns. As almost all of his observations were consumed in the conflagration which destroyed a large part of Copenhagen in the year 1728, his memory has been greatly neglected. Yet it was Roemer who invented all the principal instruments of the modern observatory—the meridian circle, the prime vertical, the altazimuth and the equatorial telescope. He lived very much in advance of his age.

The discovery of the velocity of light in 1675 was treated at length. It was made from the eclipses of the first satellite of Jupiter. Most of Roemer's contemporaries rejected his theory of the finite velocity of light, or adopted it only after long years had elapsed. The French men of science were slower in accepting the new idea than men of science in other nations. Huygens and Newton adopted Roemer's results, while Fontenelle, the perpetual secretary of the Paris Academy of Sciences had even gone so far as publicly to congratulate himself on escaping the seductive error of believing in the gradual propagation of light! Roemer gave eleven minutes for the equation of light (time in coming from the sun to the earth), but Newton reduced the value to between seven and eight minutes. The true value found by the classic researches of Michelson and Newcomb is about 8.4 minutes, to which Newton's was a close approximation.

The speaker said that with the exception of the discovery of the law of gravitation, no sublimer discovery than that of the velocity of light had ever been made. Notwithstanding the incredulty of others, Roemer had never wavered in his belief in this discovery, and the speaker said that it paved the way for the investigation of the velocity of electricity, which had been found with much accuracy.

Roemer was born in 1644 and died in 1710, all of his life except nine years being spent in Denmark. He met Picard when he came to Denmark to determine the position of Tycho Brahé's Observatory in 1671, and the following year returned with him as his assistant, and spent nine years at the Paris Observatory, just started under J. D. Cassini. Picard was much the best astronomer of his age, but had been set aside by the government of Louis XIV., and a foreigner, Cassini of Bologna, called to be superintendent of the Royal Observatory at Paris. This circumstance injured astronomy in France for many years. Roemer's association with Picard was fortunate, as this gave him the best ideas of the times, though his own genius was even greater than that of Picard, who had acquired an imperishable reputation by measuring the arc of the meridian used by Newton for verifying the theory of universal gravitation in 1685.

A picture of Roemer was exhibited, kindly sent by Professor T. N. Thiele, director of the Royal Observatory of Copenhagen. This showed a striking resemblance to Newton.

The paper will be published in an early number of *Popular Astronomy*.

Dr. A. L. Day, of the Geological Survey, discussed 'The Melting Point of a Glass,' basing his remarks on a study of borax glass, which has a melting point in the neighborhood of 730° as determined in ordinary ways. If ordinary solid bodies have heat communicated to them the temperature gradually rises till melting begins, when it remains stationary till melting is complete; and a corresponding phenomenon takes place on cooling from liquid to solid. So the curve of temperature as a function of the time shows a portion parallel to the axis of the time. The borax glass, if in the crystalline state, shows a similar straight portion, or at least a departure from the smooth curve; but if in the vitreous stage the curve may be perfectly smooth, and the material pass from liquid to solid without showing any phenomena by which to fix a melting point, as ordinarily defined.

THE 568th meeting was held April 25, 1903, in the rooms of the National Bureau of Standards through the courtesy of Director S. W. Stratton. No formal papers were presented, but the laboratories and shops were opened, and many new instruments were exhibited and explained informally. The evening was one of great interest to all visitors.

CHARLES K. WEAD,
*Secretary.*

BIOLOGICAL SOCIETY OF WASHINGTON.

THE 371st meeting of the society was held on Saturday, April 18.

W. J. Spillman spoke on 'Agrostological Problems in the United States,' using a number of lantern slides by way of illustration. These slides were prepared from the recent census reports, and showed the distribution of each of the important hay and forage crops over the country. He brought out the rather remarkable fact that by far the larger part of the hay and forage produced in this country is produced on the glacial drift, also that one fourth of the total hay and forage is produced from wild grasses, and that of the wild grasses that are thus utilized no one of them has as yet been brought into cultivation. The principal reason for this lies in the poor seed habits of these grasses, a fact which renders their use impracticable. He also gave some illustrations of the relation between certain crops and certain geological formations. It was shown that, in the state of Kentucky, Kentucky blue grass (*Poa pratensis*) is confined to a circular area in the northern part of the state, in which the dolomitic limestones of the Silurian outcrop. In a similar manner Johnson grass in the southern states is more or less closely confined to the soils of the Cretaceous. He pointed out the importance of increasing the areas of hay and forage crops, particularly in the cotton belt, where the system of farming has depleted the soil of humus to such an extent as greatly to interfere with its productivity. He stated that another very important problem was to secure suitable crops for the arid and semi-arid regions that could be grown without irrigation, and that some progress has been made in this direction.

A paper by Basil Dutcher, captain U. S. Army (Medical Corps), on the 'Mammals of Mount Katahdin,' was read by Vernon Bailey. The topography of the region was carefully described, and this was followed by a fully annotated list of the mammals. Of the larger species the moose was fairly common, the Virginia deer abundant, while the otter and lynx were still found in the vicinity. Small carnivores, the fishes, mink and weasel were said to be common, but Mr. Dutcher was able to trap but few small rodents, the only really abundant rodent being the muskrat. The fauna was that of the Canadian region, and not that of the Hudsonian.

In his paper, entitled 'Notes on the Dissemination of *Sedum douglasii* by Proliferous Shoots,' Mr. V. K. Chesnut drew attention to a comparatively undescribed natural method of plant reproduction. *Sedum douglasii*, a plant growing at an altitude of about 7,000 feet in Montana, forms axillary branches about a half inch long, which, late in the summer, become detached from the dried stem after the plant has flowered, and which are capable of reproducing the plant vegetatively. The light, spear-shaped branches

are blown about by the wind, remain dormant under the snow through the long winter season, and, if the proper conditions are present, take root in the soil the following spring. The mechanical structure of the shoots which enables the plant thus to disseminate and to perpetuate the species was described and illustrated by specimens and by photographs.

F. A. Lucas.

THE GEOLOGICAL SOCIETY OF WASHINGTON.

At the 142d meeting of the society, held in the assembly hall of the Cosmos Club, Wednesday evening, April 8, 1903, the following program was presented:

Mr. J. E. Spurr, 'The Relation of Faults to Topography.'

Folds and faults are closely associated genetically, and their effect on the surface relief is analogous. Each may be divided into three orders:

1. Those affecting great areas, as portions of continents.

2. Those affecting broad belts, producing mountain systems.

3. Folds and faults proper, being wrinkles and fractures on the grander flexures and displacements of the first and second orders.

Gravity antagonizes these disturbances, in so far as they affect surface relief. On account of the relative bulk of material to be readjusted, and for other reasons, erosion is generally ineffective in combating flexures and dislocations of the first and second orders, while folds and faults proper are generally overcome. So the anticlinal ridge and the synclinal valley of direct deformation are relatively rare as compared with the anticlinal ridge, the synclinal ridge and the anticlinal valley of erosion. Similarly, the speaker's studies have convinced him that the analogous features of relief connected with faults have about the same proportion. Simple fault-scarps (analogous to ridges and valleys of direct deformation) are relatively rare; while normal erosion fault scarps and reversed erosion fault scarps (analogous to anticlinal and synclinal ridges of erosion) are about equally abundant. The forms *indirectly* expressed on the topography by the erosion of folded and faulted rocks also differ in different climates.

Mr. Waldemar Lindgren, 'Metallic Sulphides from Steamboat Springs, Nevada.'

During a visit to Steamboat Springs in 1901, it was found that a shaft forty feet deep had been sunk through the sinter deposits near the railroad station. Below the sinter, a gravel of well-rounded granitic and andesitic pebbles was found, and in this gravel, which is probably an older deposit of Steamboat Creek, minute needles of well-crystallized stibnite were found to be very abundant. The gravel also contains well-crystallized pyrite, and some opal often coats the surface of the pebbles. From the investigations of Dr. Becker it is known that the sinters contain sulphides of arsenic and antimony, but no well defined or crystallized minerals corresponding to these salts have previously been found. Since the gravels in which the crystallized stibnite and pyrite occur seem to be free from the sulphide of arsenic which is found in the overlying sinters, it is inferred that the conditions of deposition in the two cases are different.

Mr. Geo. I. Adams, 'Origin of Bedded Breccias in Northern Arkansas.'

The fracturing and brecciation in the northern Arkansas zinc and lead district are probably due to stresses induced at the time of the folding in the Ouachita Mountain and Arkansas valley regions. At the close of the Carboniferous period the thick mass of sediments which had accumulated in what is now central Arkansas and western Indian Territory was deformed in a manner which suggests that the beds were thrust to the northward. In the Ouachita Mountains there are close folds and thrust faults; in the Arkansas valley region, open folds. In the southern border of the Ozark region, and particularly in the zinc and lead district of northern Arkansas, the generally horizontal position of the rocks was retained, but there was considerable movement of individual beds, especially in the Ordovician series. The variation in the structure of the Ordovician dolomites, which are in places massively bedded and in other places thin-bedded, lamin-

ated and even shaly, resulted in the lateral movement being taken up in varying degree by the individual beds, so that the motion was such as is produced by forces acting in couples. The brecciation is due to the tendency of the pieces, resulting from the breaking of certain brittle strata, to shear past each other, or to rotate with the horizontal movements of the adjacent beds, so that the fragments are relatively displaced.

Mr. E. C. Eckel, 'Dahlonega Mining District, Georgia.'

The country rocks in the Dahlonega district in Georgia are mica schists and gneisses of pre-Cambrian age, including possibly some metamorphosed Paleozoic. These early rocks are cut by diorites and granites; the former highly sheared, the latter but slightly gneissoid. The gold-bearing quartz veins occur along the contacts of the diorites or granites with the mica schists. The veins show but little deformation, and the epoch of vein formation, as well as of the intrusion of the granites, is therefore thought to be not earlier than the Ordovician. This view is confirmed by the occurrence of gold veins in the Ocoee (Cambro-Silurian) rocks of Georgia and Tennessee, and in Ordovician rocks in New York.

W. C. MENDENHALL,
*Secretary.*

NEW YORK ACADEMY OF SCIENCE. SECTION OF GEOLOGY AND MINERALOGY.

A REGULAR meeting of the Section of Geology and Mineralogy was held at the American Museum of Natural History on the evening of March 16. In the absence of Professor Kemp, Dr. Julien was made temporary chairman.

The first paper was by Dr. A. W. Grabau on the 'Geology of Becraft Mountain, New York.' Becraft Mountain, in Columbia Co., N. Y., is an outlier of the Helderberg Mountains. Its base is formed by the upturned and eroded rocks of the Hudson Group, chiefly the Norman's Kill shales. Unconformably upon this rests the upper part of the Manlius limestone, followed in turn by the members of the New York Devonian up to and including the Onondaga limestone. The structure of the eastern and southern portion of the mountain, which is of the Appalachian type, was discussed, and the excessive folding and faulting upon it illustrated by maps and sections. The paper was discussed by Dr. Stevenson and by Dr. Julien.

The second paper, by Mr. C. W. Dickson, was entitled 'The Mineralogy and Geology of the Sudbury Ontario Copper Nickel Deposits.'

It was shown that by magnetic concentration of the ore nearly all the nickel can be eliminated from the pyrrhotite, proving that the element is present in a separate mineral and that it does not replace part of the iron of the pyrrhotite isomorphously. The economic concentration of the nickel by magnetic methods is, however, practically impossible. The composition of the nickel mineral corresponds closely to that of pentlandite, but there is always an excess of (Fe + Ni) over that required by the formula (Fe + Ni)S in the proportion 11:10.

After studying the relations of the ore and rock minerals in the field and by the aid of the microscope, the conclusion was reached that the deposits are replacements along crushed zones through which the mineral-bearing waters circulated, and that they can not be original magmatic segregations, as generally held.

GEORGE I. FINLAY,
*Secretary pro tem.*

ELISHA MITCHELL SCIENTIFIC SOCIETY.

THE 148th meeting was held in the chemical lecture room, University of North Carolina, April 14, 7:45 P.M.

The following papers were read:

'The Prices of Anthracite Coal in the United States, 1850–1902,' by Professor C. L. Raper.

'Habits of North Carolina Woodpeckers,' by Mr. Ivey F. Lewis.

'Note on Imaginary Roots of a Cubic,' by Professor Wm. Cain. Certain characteristics of the graphs of functions of the third degree were established and easy tests found (not

involving the discriminant) to ascertain when cubic equations had imaginary roots.

Chas. Baskerville,
*Secretary.*

## *DISCUSSION AND CORRESPONDENCE.*

### ECOLOGY.

To the Editor of Science: I read with much interest Professor Fernow's article, bearing the above caption, in Science, April 17, an article attractively written and containing many valuable suggestions.

I do not propose to enter into the general discussion outlined by the author, but shall confine myself to the paragraphs on the soil. It would not be right to allow so misleading a statement as 'it is first of all to be considered that chemical constitution [of the soil] plays probably only a small part or practically none; the reliance of tree growth on mineral constituents being relatively small' to go without protest.

The chief fact that is adduced in support of this dictum rests on the small percentage of ash in the grown tree and its greater abundance in the leaves and younger growth.

The growth of a tree is as absolutely conditioned by 'mineral constituents' as by any other fundamental factor of the environment. Vines says: 'Thus the inorganic substances absorbed by the roots pass into the cells of the leaves where they are concerned in the processes of constructive metabolism which are in operation in those organs.'

It is apparent that without this 'constructive metabolism' the materials of which the chief part of the plant is composed, mostly carbohydrates, could never be provided.

One of the functions of the absorption of water as such by plants is to secure the translation of these mineral elements from the soil to the parts of the organism where their constructive work is to be done.

Vines says: 'Only very dilute solutions of salts can be taken up by the roots; as a consequence, it is necessary that relatively large quantities of water should be absorbed in order that the plant may be supplied with the salts which are important in nutrition.'

The tree, during the whole period of its growth, does not use from without a single organic product. It gets its nitrogen in the form of nitric acid, its carbon in the form of carbon dioxid, its phosphorus in the form of phosphoric acid, its hydrogen in the form of water, and so on to the end of the nutrients. The fact that mineral matters are exuded in the leaves is no proof that they have not performed or assisted in performing the most important physiological functions. The excretion of a 'mineral constituent' may even be a proof of its importance in metabolism, as is the case with a great part of the phosphorus that is excreted from the body. Nature is careful to provide a superabundance of the most important substances. Because a tree may take up only one millionth part of the carbon dioxid which comes to it in the air during its period of growth, is no reason for saying that this constituent of the air is of little consequence in biodendry.

Mineral substances not only are useful and necessary in plant growth because of their part in forming tissues, but also because they stimulate by their presence the functional activity of the vegetative cells. In other words, they are condimental or katalytic as well as constitutional. Although potash is not a constituent of starch, it is thoroughly established by indubitable evidence that in the absence of potash in the plant blood starch granules are not formed.

The ions of mineral matter taken from the soil and coursing through the circulating apparatus of the tree perform useful and necessary functions from the time they enter the waiting mouth of the rootlet until they congregate in the extremest tip of the reddening leaf.

The 'mineral hunger' of plants is as well known and recognized by physiologists as that of animals, and the welfare of the growing tree is undoubtedly as profoundly affected by the soil element of its environment as by any other. Experiments have shown the minimum of any given mineral element of the soil which will permit normal development, but such a minimum only does so in case other mineral