

seum work. The chapter on 'The Mineralogical and Geological Cabinets,' by D. S. Martin, contains many interesting references to Cooper, Le Conte, Holmes and others of our earlier mineralogists and geologists.

SOCIETIES AND ACADEMIES.

THE PHILOSOPHICAL SOCIETY OF WASHINGTON.

THE 610th meeting, the 35th annual meeting, was held on December 30, 1905, President Littlehales in the chair.

The report of the secretaries showed 126 members on the active list, a small net gain during the year, and 74 on the absent list.

The report of the treasurer showed an income of \$802.19 and expenses of \$413.27 during 1905.

The following officers were elected for the year 1906:

President—Cleveland Abbe.

Vice-Presidents—A. L. Day, E. B. Rosa, L. A. Bauer and J. F. Hayford.

Treasurer—Bernard R. Green.

Secretaries—C. K. Wead and G. K. Burgess.

General Committee—W. A. DeCaivelry, W. S. Eichelberger, L. A. Fischer, C. Adler, R. A. Harris, J. Page, C. G. Abbot, L. J. Briggs and I. Winston.

To this committee there will be added such of the past-presidents residing in Washington as shall consent to serve on it.

THE 611th meeting was held on January 13, 1906, President Abbe in the chair.

Mr. C. G. Abbott read a paper on 'A Standard Pyrheliometer and its Use on Mt. Wilson in California.'

Three independent lines of research are being carried on by the Smithsonian Astrophysical Observatory to determine if the output of solar radiation is variable. One of these consists in obtaining values of the 'solar constant' of radiation outside our atmosphere, by the spectro-bolometric method of homogeneous rays practised many years ago by Mr. Langley on Mt. Whitney. The author was in charge of a Smithsonian Observatory expedition to Mt. Wilson in California to determine solar constant values during the past summer and autumn, and had with him a

complete duplicate of the outfit simultaneously used for the purpose in Washington.

Measurements by the pyrheliometer or actinometer of the total radiation reaching the surface of the earth are necessary, as well as spectro-bolometric observations. Distrust was entertained of the accuracy of all instruments heretofore proposed as standard actinometers or pyrheliometers, for the reason that the rays are always received upon a front, or outside surface, while the measurements of temperature are made behind or within. Hence the absorbed heat has a path of direct escape to the surroundings and no allowance for this can be made either by cooling corrections, by reading with the temperature recording apparatus at the temperature of the surroundings or otherwise. In illustration, the nature of the error in the instruments of Pouillet, Ångström, Nichols and Hull and others, was pointed out.

No easy method of determining the magnitude of the error being found, a new instrument in which the rays are absorbed at the conical rear end of a tube-like blackened and diaphragmed chamber was devised. This chamber is approximately the 'black body,' or perfect absorber, of Kirchhoff, so that no correction for reflection is needed. On account of its shape there is great hindrance to the escape of heat by radiation or convection, so that the heat will almost wholly be retained somewhere on the walls. The chamber walls are bathed by a spiral current of water whose difference of temperature before and after passage is determined by a platinum thermometer. To assure that no heat is lost, a known current of electricity can flow through a coil of wire near the rear within the absorbing chamber, and this known heating can be determined as if it came from the sun. The mean of nine comparisons made in this way on Mt. Wilson indicated 100.4 per cent. of the heat introduced found, with a probable error of less than half per cent. Sun heat is more favorably received than coil heat and should be more exactly measured.

The instrument is naturally perfectly continuous in its action, and was mounted equatorially on Mt. Wilson, the galvanometer

measuring the rise of temperature of the water recorded photographically, and the rate of flow of the water, and time of observation were also automatically recorded.' This continuous, self-recording and proved instrument is thought to be a *standard pyrheliometer*.

In the general discussion that followed, attention was called to Professor C. A. Young's observations with a faulty Pouillet pyrheliometer in 1872 at Sherman, Wyo., and by Mr. Rosa to the analogy of the new instrument to his great calorimeter used in physiological experiments at Middletown.

Mr. L. J. Briggs then described the 'Centrifugal Methods of Soil Investigation' used at the Department of Agriculture, where some 3,000 soil analyses are made per annum. Since a force 2,000 times that of gravity is available it is easy to produce stratification in a five-gram sample of soil and then to determine the percentages of sand, silt or clay. Further, the water-content of such soils that remains after exposure to a drying force is found as a function of the force and of the percentages of the soil-constituents. Lantern slides illustrated the apparatus and many results. The velocities used run up to 5,000 turns per minute; but a steam turbine has been ordered capable of reaching 30,000 turns.

CHARLES K. WEAD,
Secretary.

THE BIOLOGICAL SOCIETY OF WASHINGTON.

THE 407th regular meeting of the Biological Society of Washington was held December 8, 1905, with the president in the chair and thirty-seven persons present.

This meeting was in celebration of the twenty-fifth anniversary of the foundation of the society, at which the following papers were read:

The Potomac-Side Naturalists' Club (here given in full): Professor J. W. CHICKERING.

In the *Floræ Columbianæ Prodrômus*, compiled by John A. Brereton, M.D., U. S. A., and 'printed in Washington by Jonathan Elliot, and sold at his store on Pennsylvania Avenue' in 1830, we find it stated in the preface that

During the spring of the year 1825, after the dissolution of the late Washington Botanical Society, a few gentlemen of this city, devoted to the science of botany, formed an association, with an earnest determination to explore and to investigate, *de novo*, the indigenous plants growing in the District of Columbia.

This association under the name of 'The Botanic Club,' consisted of Wm. Meehlin, Alex. McWilliams, M.D., Wm. Rich, the compiler, and during the following year, of James W. Robbins, M.D.

One result of this association was the publication of this 'Prodrômus' containing 1,922 species. How long 'The Botanic Club' lasted, we know not.

In the 'Records,' which have come into my possession, of the Potomac-Side Naturalists' Club, it is set down that in January 29, 1858,

With the view of forming a scientific club, especially devoted to Natural History, the following gentlemen met at Mr. Simpson's house at seven o'clock in the evening: Mr. T. R. Peale, Dr. E. Freman, Prof. G. C. Schaefer, Dr. C. Girard, Dr. F. V. Hayden, Dr. T. G. Cooper, Mr. Robert Kennicott, Mr. W. Stimpson, with Professor Turner and Mr. W. R. Smith recognized as present in spirit and thus original members.

They adopted the name of Potomac-Side Naturalists' Club, with the provisions that:

The meetings shall be held every Monday evening. The members shall severally entertain the club in rotation in alphabetical order.

The member whose name follows the entertainers, shall at each meeting, deliver a lecture or read a paper upon some subject in natural science chosen by himself.

This meeting adjourned at 2:30 A.M.

In this catalogue are found the names of about fifty members, only a very few of whom still survive.

Two very interesting record books still remain, with accounts of each meeting, members present, papers read, and discussions following.

In the various departments of investigation and discussion, geology most frequently occupied the evening, with zoology, botany and general science, following closely after, in frequency of notice.

The average attendance was ten to fifteen.

At one meeting we find a note.

That every active member of the club shall in each current year or session of the club be required to perform the amount of duty imposed in common upon all, *i. e.*, to read a paper, to receive the club, and preside at a meeting, and that his failure to do so shall be regarded as sufficient reason for erasing his name from the list of members.

Field meetings were held frequently, and botanical novelties exhibited when discovered.

Photography was a frequent subject of discussions.

In 1864, being the seventh year of the existence of the club, the second volume of the records was begun, recording the 128th meeting.

But on March 26, 1866, the record of the 146th meeting closes with 'adjourned *sine die*.'

On May 1, 1873, a meeting was called of those interested in the formation of a Natural History Society for Washington and vicinity, at the house of Professor W. H. Seaman.

Among others present were Professors Baird and Gill, who gave a brief sketch of the two previous societies, and their instrumentality in promoting scientific research and social enjoyment, but adding that they both went to pieces upon the same rock, that of expensive entertainments. Mr. W. R. Smith presented and confirmed the same views.

In the light of these historical reminiscences, it was voted that we resuscitate the old Potomac-Side Naturalists' Club, with meetings at each other's houses, on alternate Monday evenings, but that all refreshments be dispensed with at these meetings. From that time on, meetings were held with tolerable regularity and much of interest, especially in the department of botany.

The members interested in that specialty set themselves to work upon a re-investigation and re-determination of the flora of the district, and a careful comparison of the species found now, with those enumerated in Dr. Brereton's 'Prodromus.'

During the floral season, the meetings were largely devoted to the exhibition and examination of species brought in, or reported as having been found by the botanical members.

Out of this activity grew, in large measure, the 'Guide to the Flora of Washington and Vicinity,' by Professor L. F. Ward, that most valuable aid to the student of botany in this region, published under the direction of the Smithsonian Institution in 1881.

The list of members of this reorganized society numbers fifty-eight, embracing a large number of the well-known scientists of Washington. The average attendance was six to fourteen.

A very interesting feature and help to its existence and activity, was the publication by Mr. Charles R. Dodge, of *Field and Forest, Bulletin of the Potomac-Side Naturalists' Club*, a monthly magazine, containing records of the club meetings, the papers read, and other papers by specialists.

This was continued from 1875 to 1878.

In a circular sent out by the secretary in February, 1876, is found the following statement:

Our club, since its reorganization in 1875, has kept up its meetings, fortnightly, except during the summer vacation.

Since April, 1874, it has found comfortable quarters in the Franklin School building, furnished on condition that the club deposit there a collection of the flora and fauna of the district.

Such a collection is gradually accumulating, and a large amount of material is now in the hands of individual members, awaiting suitable cases for exhibition and preservation.

I fear this hope was never realized.

The club continued its meetings and its activity for about five years, till we find in the record book under date of February 11, 1878, the record of the 218th meeting, but nothing further, and no note of dissolution, so that the organization remained in a state of 'innocuous desuetude,' till the organization of the Biological Society, in 1880, attracted most of the members, and seemed to fill the place formerly occupied by the old Potomac-Side Naturalists' Club.

Its place is now occupied by a number of societies, but its interesting records and its pleasant memories still remain with the few surviving members.

The Early Days of the Biological Society:

THEODORE GILL.

Then followed numerous notes regarding the work, former and recent, by members of the society, these being given by Mr. Henry Ulke, Dr. L. O. Howard, Dr. E. A. Schwarz, Professor W. P. Hay, Dr. C. E. Waters, Mr. W. H. Osgood.

The Present and Future of the Biological Society: President F. H. KNOWLTON.

E. L. MORRIS,
Recording Secretary.

THE GEOLOGICAL SOCIETY OF WASHINGTON.

At the thirteenth annual meeting of the society held on December 13, 1905, the address of the retiring president, Dr. George P. Merrill, entitled 'Development of the Glacial Hypothesis in America,' was presented.

The following officers were elected:

President—George P. Merrill.

Vice-Presidents—Waldemar Lindgren and M. R. Campbell.

Secretaries—George Otis Smith and Arthur C. Spencer.

Treasurer—M. L. Fuller.

At the 173d meeting of the society, January 10, under the head of informal communications, Mr. Fuller described several blowing wells in Georgia. In the case of a certain well investigated where there were in-draft from early morning until about 10 A.M., and after that an out-draft until evening, observation extending over several days showed that the change accompanied a fall in the barometer. Instances of constant in-draft were explained by drawing an analogy to the familiar hydraulic filter pump of the chemical laboratory.

Mr. Gilmore gave an interesting description and exhibited photographs of a skeleton of *Triceratops* from the Laramie formation of Wyoming which he has recently articulated at the National Museum.

Mr. R. S. Bassler exhibited some fossil cystids from the Chazy-Black River strata of the Virginia valley. The speaker stated that when these forms occur in slaty beds they are always greatly deformed, and it is only in the limestone strata that their original globular

shape is retained. In specimens where the surface plates are well preserved each plate is reinforced by a column of calcite having approximately the same shape as the plate against which it terminates, and each column is found to be a single crystal. The columns extend toward the center of the cystid, which is frequently hollow, so that the whole affair constitutes a small geode.

The regular program was as follows:

Algonkian Formations of Northwestern Montana: Mr. C. D. WALCOTT.

This was a repetition of the paper given by Mr. Walcott before the Geological Society of America at Ottawa, which will appear in the forthcoming volume of the *Bulletin* of that Society.

The Franklin Mountains, Texas: Mr. G. B. RICHARDSON.

The Franklin Mountains are the southern extremity of the long, narrow range, known locally by different names, that extends southward from the Rocky Mountains and delimits the Rio Grande Valley on the east as far as El Paso. The mountains are about fifteen miles long, average three miles in width, and rise 3,000 feet above the adjacent low lands. The western face is relatively little dissected and constitutes a dip slope. The eastern side, on the contrary, is much dissected and exposes cross sections of the rocks. From a distance the range appears to be simple, but closer inspection reveals complex conditions.

The oldest rocks in the Franklin Mountains are of pre-Cambrian age and include two distinct formations which aggregate 3,400 feet in thickness. The lower one consists of light and dark quartzite and subordinate slate which have been cut by a few thin diabase dikes. These rocks are succeeded by a bed of rhyolite tuff, ranging from zero to 400 feet in thickness, above which is a mass of porphyritic red rhyolite over 1,000 feet thick. Three hundred feet of indurated, fine-textured sandstone, carrying upper Cambrian fossils, overlies the rhyolite and contains rounded pebbles of the latter in the basal bed. The sandstone is succeeded by a considerable thickness, amounting to at least 5,000 feet, of massive, gray lime-

stone which lithologically is difficult to subdivide, but paleontologically is separable into three main parts which are referred to the Ordovician, Silurian and upper Carboniferous. The Devonian and Mississippian are not represented by sediments. All of these rocks, from the pre-Cambrian to the Carboniferous, are structurally conformable and dip westward at angles varying from 20 to 45 degrees in different parts of the range. A considerable amount of coarse, red granite of post-Paleozoic age occurs in the mountains, chiefly associated with lines of faulting. No sediments of early Mesozoic age are here present, but Cretaceous strata, including the Washita and Benton groups, occur in isolated areas west and south of the range. The adjacent lowlands are underlain by unconsolidated material to a depth of over 2,000 feet.

The rocks are traversed by two prominent sets of joints, striking north-south and east-west, and the distribution of the strata reveals several large faults in both of these directions. The main faulting is parallel with the north-south trend of the range, and as the strata dip invariably toward the west, the internal structure shows a series of tilted blocks. Whether the whole range is a large block limited on the east and west by faults can not be determined since the mountain bases are buried under deep accumulations of débris. The fact of recent movements is proved by the presence of minor faults in a sand bank in the northern part of El Paso. These displacements follow the same trend as the principal faults in the mountains. A detailed description of this region will appear in the forthcoming El Paso folio of the geologic map of the United States.

The Santa Fe Peneplain: MR. M. R. CAMPBELL.

Mr. Campbell spoke of the existence of a surface of low relief in the vicinity of Santa Fe and its extension northward along the valley of the Rio Grande into San Luis Park, and suggested the probable correlation of this surface of erosion with the peneplain of the great plains region.

ARTHUR C. SPENCER,
Secretary.

THE SOCIETY OF GEOHYDROLOGISTS, WASHINGTON.

THE third regular meeting of the society was held on January 17. The following program was presented:

Method of Sinking Wells in the Sahara: W. T. LEE.

The wells of the Sahara, as described by recent visitors to the region, are still sunk in the same way as they have been for a thousand years. A hole about eighteen inches square is dug to a gypsum layer overlying and confining the water bed at a depth of about 200 feet. The capping is then punctured with a bar by a man at the bottom of the well. In the rush of water which follows the driller does not always escape.

Depth Reached by the Deepest Borings: B. L. JOHNSON.

In this paper only wells or borings having depths over 4,000 feet are considered. Data regarding 48, which are distributed as follows have been obtained: Transvaal, 24; United States, 10; Germany, 6; Queensland, 6, and New South Wales, 1; South Australia, 1. The six deepest are given below in the order of their depth. They are separated from the next deepest by a considerable gap: Paruscho-witz, Upper Silesia, Germany, 6,572.6 feet; Schladebach, near Leipzig, Germany, 5,735 feet; Springs, 25 miles east of Johannesburg, Transvaal, 5,582 feet; West Elizabeth, 12 miles southeast of Pittsburg, Pennsylvania, 5,575 feet; Doornkloof, Transvaal, 5,560 feet; Aleppo Township, Greene County, Pennsylvania, 5,322 feet.

Recently Reported Blowing Wells: SAMUEL SANFORD.

In connection with the collection of well records and samples many new instances of blowing wells have come to light. Previous instances have been mainly from Nebraska and adjacent states, but several in the eastern states, including Iowa, Missouri, Arkansas, Louisiana, Wisconsin, Michigan, Indiana, New York, South Carolina and Georgia, are now known. Those of New York, Michigan, Wisconsin and Iowa are in the drift; those of Missouri and Arkansas, in cavernous limestone; those of Louisiana, Georgia and South

Carolina in coastal plain deposits; and those of Indiana in sandstone.

Continuously sucking wells are reported in Georgia and Nebraska, but in general the wells are of the breathing type, the movement being outward or inward according to barometric pressure.

Symbols for Representing Underground Water

Data: Discussion by members of the society.

To secure uniformity it is considered advisable to adopt some simple set of symbols for use in reports. A circle for wells and a circle with a short irregular line leading off from it (suggesting a stream) for springs were favored. For successful wells the circle is to be made solid (dot), while for unsuccessful wells the circle alone is to be used. Mineral wells are indicated by a dot within the circle. A vertical bar for waters which rise in the wells, a cross (consisting of vertical and horizontal lines) for flows, and a horizontal bar for thermal properties in springs were suggested, each to be superimposed on the fixed symbol for common or mineral wells and

M. L. FULLER,
Secretary.

DISCUSSION AND CORRESPONDENCE.

A NEW WORLD FOR THE BLIND.

IN *Harper's Magazine* for January, 1860, there is a story by J. D. Whelpley called, 'The Atoms of Chladni.' The tale itself has interest for the curious only, but it pivots upon a contrivance which, as described, is an illustration of the fact that the fancy of man has often anticipated the scientific discoveries of a succeeding time. 'The old discoveries of Chladni' are alluded to as the initial idea whence sprang the mechanism devised by 'Bonsall,' the Merlin and Mephisto of the tale. A broad plate of thin metal is described as suspended from the ceiling by threads of silk. This plate may be 'electrified by vibration.'

The mirrors of your ceiling are each a vibrating plate. From the upper surface of these rise wire conductors of the electric power generated by the vibration. This is faint and feeble at

first, but, by passing through metallic threads coiled a thousand times around small magnets each geometric division of the plate corresponding with a magnet and with a radical sound of the human voice—it has power to connect and disconnect the keys of the batteries. * * * Thus are pinned more or fewer points in this strip of paper, from which, by such wonderful means, has been read off and written every clearly articulated sound uttered in your apartments. There are ninety distinct entries of the record, said Bonsall, closing the book, and of these more than twenty are conversations between the same pair of affectionate lovers. All must have taken place in your room. Your villainous machine records words spoken in your room, above the mirror, as clearly as if they had been uttered below it, in my chamber.

Within the past year or two there have appeared in the magazines and newspapers of the world accounts of a remarkable invention. From one of these—*The Boston Evening Transcript*, October 14, 1905—I quote the following account:

Conceive a piece of steel wire, generally known as 'piano wire,' stretched between two points, or a steel plate. Take an ordinary electromagnet and connect the coil of it in circuit with the secondary of an induction coil, the primary of which is in circuit with a microphone and battery. On speaking into the microphone induced currents of electricity produce continuous variations in the field strength of the electromagnet, and if we slide the electromagnet along the steel wire or over the plate the magnetic fluctuations of the electromagnet affect the steel wire or plate in the form of variable magnet intensities. There have been impressed on the steel surface undulations of magnetization, a kind of writing that is virtually permanent, and which faithfully records the articulations of the voice. If the coils of the electromagnet are connected with the telephone receiver, and the magnet is made to travel over the steel wire again, the telephone receiver repeats what was spoken into the microphone; or, in other words, acoustic vibrations analogous to the original vibrations of the microphone are produced in the telephone receiver. The records thus made will last for years. The steel wire or plate may be polished without disturbing it. Rust has no effect upon the record. The message remains there until a heavier magnet is drawn over the wire, when it is wiped off or demagnetized.

In one form of the machine a steel plate is