

and its liberal patron leads one to look for results far more full and satisfying than have yet been secured.

CHARLES K. WEAD.

SCIENTIFIC JOURNALS AND ARTICLES.

The Popular Science Monthly for June contains a series of papers 'On the Definition of some Modern Sciences,' presented originally before the Philosophical Society of Washington. The 'Introduction' is by W. H. Dall; Carroll D. Wright defines 'Statistics,' Roland P. Falkner 'Political Economy,' E. A. Pace 'Psychology' and Lester F. Ward 'Sociology.' Marshall O. Leighton discusses 'The Commercial Value of Human Life,' concluding that the pecuniary value of life is subject to the same economic laws as are applied to other commodities. 'Instinct' by Douglas A. Spaulding is a reprint of much value, as it contains the record of a series of important experiments on young birds which seem to prove that instinct is indeed inherited memory. Arthur C. Scott has an article on the 'Educational Value of Photomicrography,' describing some of the methods used and showing some of the results obtained. John Waddell considers 'Sugar and the Sugar Beet,' stating that the profits of beet raising average twenty dollars per acre. There is a biographical sketch of 'Peter Guthrie Tait' by C. K. Edmunds and J. McKeen Cattell presents some very decided ideas 'Concerning the American University.' There are also some good brief articles under 'The Progress of Science.'

In *The American Naturalist* for May Henry F. Osborn discusses 'The Law of Adaptive Radiation,' the differentiation of habit in several directions from a primitive type. One of the conclusions reached is that function precedes structure. Charles T. Brues describes some 'New and Little Known Guests of the Texan Legionary Ants,' and in 'The Structure and Classification of the Tremataspidae' William Patten presents the evidence for the arthropod affinities of the primitive 'fishes,' proposing for *Pterichthys* and allied forms the new class Peltacephala. Elliot W. Downing considers 'Variation in

the Position of the Adductor Muscles of *Anadonta grandis* Say.' The number contains the Quarterly Record of Gifts, Appointments, Retirements and Deaths.

The Plant World for April contains 'Suggestions for the Preservation of Our Native Plants' by F. H. Knowlton, 'Among Florida Ferns' by A. H. Curtiss and shorter articles and reviews. In the Supplement Charles L. Pollard treats of the families of the Orders Primulales and Ebenales and begins that of the Gentianales.

Bird Lore for May-June opens with an article on 'The Increase of the Chestnut-sided Warbler' by A. Radclyffe Dugmore, illustrated with reproductions of some good photographs by the author. Francis H. Herrick writes of 'The Chebec's First Brood,' and Gerard A. Abbott describes 'A Grebe Colony.' The fourth paper of the series 'How to Name the Birds,' by Frank M. Chapman treats of the Tanagers, Swallows, Waxwings and Shrikes. The shorter articles, including notes, reviews and editorial comment, are all interesting.

The Museums Journal of Great Britain for May contains a description of the new Glasgow Art Gallery and Museum, which was an outcome of the successful international exhibition of 1888. The cost will be not far from \$1,250,000. There is a series of notes on 'Some South African Museums' which shows that steady progress is being made in natural science, and the balance of the number is taken up with notes on British and foreign museums.

SOCIETIES AND ACADEMIES.

PHILOSOPHICAL SOCIETY OF WASHINGTON.

THE 553d regular meeting was held May 10, 1902, Vice-President Gore in the chair.

The first paper was by Dr. S. P. Langley, 'On the Laws of Nature,' is printed in the current issue of SCIENCE.

Mr. C. G. Abbot, of the Smithsonian Astrophysical Observatory, then read a paper on 'The Relation of the Sunspot Cycle to Meteorology.*' The author admitted as proved

* This paper will appear in the *Monthly Weather Review* for April.

that terrestrial magnetism and electricity, including the aurora, are directly affected when sunspots appear, and that while the evidence is less simple in the case of the meteorological elements, temperature, pressure, humidity and rainfall, there is a strong probability that they too are somewhat affected along with the sunspot frequency.

While admitting the possibility that magnetic and electrical disturbances are the causes of these meteorological changes attention was devoted only to the often made suggestion of a variability of solar radiation as an explanation of the supposed meteorological effects. Lockyer's views were discussed, and Halm's theory mentioned. It was pointed out that there is a ready way of determining whether changes of transmissibility in the solar atmosphere exist as required by Halm's theory. The great hindrance offered by the earth's atmosphere to direct measures by the actinometer of the variability of solar radiation was pointed out, and the variations noted in the results obtained at Montpellier since 1883 were attributed to the influence of water vapor. It was, however, pointed out that spectral actinometry by the aid of the spectro-bolometer might be more conclusive.

Professor C. Abbe presented the next paper. He said Professor A. Wolfer, who now succeeds Professor A. Wolf as Director of the Federal Observatory at Zurich, has lately revised the so-called Tables of Numbers expressing relative sunspot frequency, and has communicated the results of this revision to the Weather Bureau. By incorporating a number of newly discovered observations, especially a long series made at Kremsmünster, and by revising all computations so as to eliminate numerical errors, Professor Wolfer is now able to present a greatly improved table of numbers for each month from 1740 to date, and a list of the dates of each maximum and minimum since the days of Galileo. There is no evidence from this table of the thirty-five-year period, but a slight periodicity of fifty-five years is apparent. The intervals from minimum to maximum are always shorter than from maximum to minimum; that is to say, sunspots increase more rapidly than

they decrease; moreover the intensity of a maximum is greater in proportion as the rate of formation of sunspots is greater. Professor Newcomb's studies on the sunspot period remain unaltered by the revision.

The communication will be published in full in the next number of the *Monthly Weather Review*.

THE 554th regular meeting was held May 24, 1902, Vice-President Marvin presiding.

Mr. L. A. Bauer called attention to the remarkable magnetic disturbances now occurring, although this is near a sunspot minimum, and to simultaneous disturbances recorded at Cheltenham, Md., in Kansas and in Honolulu on April 18, the date of the Guatemalan earthquake; and to other disturbances closely coincident with the Martinique outburst. A fuller report of this matter will appear in *SCIENCE*.

The first regular paper was by Mr. G. K. Gilbert, 'On the Mechanism of Volcanoes.' The speaker said the matter to be presented was timely rather than novel. He accepted generally Major Dutton's views, but illustrated them by various instances from his own observations. The first problem is why the lava comes up: the primary force is gravitation, and the column of lava must exert less pressure in the depths than the neighboring solid rocks; accordingly the heavy, basic lavas, as basalt, in order to become light enough to rise must be highly heated, and are then very fluid; while the lighter, acid lavas rise in a very viscous condition, and flow slowly. The flow ceases because the supply of material lighter than the crust runs out. It is not yet clear how the liquid pierces the crust. Eruptions are of three kinds: dry, and then the lava flows quietly out of the crater or fissures; or wet, and then the occluded water expands into steam as the lava rises, thus forming a porous mass, as pumice, and liberating dense clouds; or explosive, as at Krakatoa, under conditions not well understood. Considerable discussion followed the paper.

Professor A. F. Zahm then read a paper on 'New Methods of Experimentation in Aerodynamics,' outlining a portion of the researches of Mr. Mattullath and himself at the Catholic

University of America, and describing the equipments and instruments of the laboratory of aerodynamics recently erected there by Mr. Mattullath. Both gentlemen have been working on similar problems for many years, and Dr. Zahm was Secretary of the Aeronautical Congress at Chicago in 1893. On the floor of the laboratory is a wooden tunnel fifty feet long by six feet square in cross section, having a five-foot suction fan at one end and a netting, or two, of close mesh at the other. A wind is thereby generated of practically uniform velocity and direction, the speed varying less than one per cent., the direction but a small fraction of a degree. In this current are held objects whose resistances, lift, drift, skin-friction, etc., are to be measured. Among the various anemometers and wind-balances designed for this purpose, is a pressure gauge graduated to millionths of an atmosphere, and which may be adjusted to read to less than one ten-millionth. It is connected by hose to one or more Pitot nozzles, and is used to measure the air velocity and pressure at all points of the stream, particularly in the neighborhood of the exposed body. The prime motive of these investigations is to furnish a basis for calculations in aeronautics, particularly in the theory of mechanical flight.

The Society then adjourned till October 11, 1902.

CHARLES K. WEAD,
Secretary.

DISCUSSION AND CORRESPONDENCE.

VOLCANIC DUST AND SAND FROM ST. VINCENT CAUGHT AT SEA AND THE BARBADOS.

SOME days ago the Weather Bureau forwarded to the Geological Survey for examination a package of volcanic dust which had been collected May 7 at sea on board the British steamship *Coya* by Capt. Thomas in latitude $11^{\circ} 21' N.$, longitude $57^{\circ} 47' W.$, or about 275 miles southeast of the island of St. Vincent, W. I. The dust began to fall about 10 p. m. May 7, and Capt. Thomas reports it thickest between midnight and 2 a. m. May 8th. At 1:30 p. m. local or sun time there was absolute darkness. The dust was supposed by Capt. Thomas to have resulted from the erup-

tion on Martinique or St. Vincent. The upper currents of that region during May 5, 6 and 7 were reported west with easterly surface winds. The transfer of the dust is therefore probably due wholly to upper currents, but the matter cannot be advantageously considered until the facts of distribution over the whole field are available.

The material is yellowish-gray in color, and to the naked eye of remarkably uniform fineness, having been thoroughly assorted from the larger fragments in its long flight. The gritty feel suggests that its particles are sharp and angular, and so they are, in strong contrast with the smooth round grains of the wind-blown desert sands which roll upon the surface.

The particles are so small that a microscope must be used for their study and reveals a range in their size from a diameter of .3 mm. down to .001 mm. or less. The largest particles have a sp. gr. of 2.7, with others almost as large having a sp. gr. 3.3. Considering the great distance this dust traveled through the air before falling to the vessel, it is surprising that it sinks so rapidly in water. Stirred into distilled water and allowed to stand, in five minutes fifteen per cent. falls to the bottom, in ten minutes fifty-seven per cent., in ninety minutes ninety-seven, and yet this material traveled through the air 275 miles. It must have been hurled up very high and carried away by strong currents.

The dust is a mixture of crystal fragments and glass and is clearly of volcanic origin. The crystal fragments constitute about sixty per cent. of the whole mass, and embrace feldspar, pyroxene, magnetite and possibly a number of other minerals not readily identified under such conditions. Feldspar is by far the most abundant mineral, occurring frequently in cleavage plates some of which show well-defined albite twinning, while others probably parallel to a different cleavage do not. The extinction angles, which rarely rise to twenty degrees, indicate that the feldspar approximates labradorite or bytownite, although there may be some orthoclase present. Many of the feldspar grains are full of included glass and other matter at times arranged in bands