

are therefore recommended, and have indeed been adopted by many of the County Councils. Mr. Webb's concluding summary and his observations on methods of training teachers, which are the outcome of many years' practical experience, may be commended to all interested in the subject. Much good is hoped to result from the Nature-Study Exhibition to be held in London in July. Educationists will then "be enabled to compare the results of the efforts to promote 'nature-study' which are now being made in many directions and under varied conditions, and in this way an opportunity will be afforded to shape and to consolidate opinion upon a branch of our educational economy which has escaped hitherto that concentrated attention so necessary for its development."

THE May number of the *Contemporary Review* contains two articles upon scientific subjects. Prof. W. Ramsay describes the present state of our knowledge of different forms of radio-activity and Mr. J. B. Carruthers deals with a subject of a more immediate economic interest, perhaps, viz. plant sanitation. After an explanatory introduction, necessary to introduce the general reader to the terms he afterwards employs, Prof. Ramsay gives a historical sketch of the work done in the direction of perfecting our knowledge of radiation, from the time of Davy down to the present day. He explains the general characteristics of ultra-violet, kathode and X-rays, and proceeds to treat in more detail the work of Poincaré, Henry, Curie, Debiere, Schmidt, Rutherford, Becquerel and others. In conclusion, Prof. Ramsay points the moral upon which NATURE has always insisted—"Whatever be the true explanations of these mysteries, it cannot be denied that they form the beginnings of what may, and almost certainly will, affect the material future of the human race. . . . It is true that investigators like Hertz, Lenard, Becquerel and the Curies do not make practical applications of their discoveries; but there is never any lack of men who discover their practical value and apply them to ends useful to mankind. All the more reason, therefore, that every encouragement should be given to the investigator, for it is to him that all our advances in physical and material well-being are ultimately due." Mr. Carruthers urges that if the same care were taken with plants as has been done to eliminate disease in men and animals, there would be many fewer plant troubles than the agriculturist has to contend with at the present time. He pleads for the introduction into this country of the means taken by the State in America, continental countries and some of our colonies, to discover and eradicate disease in plants.

WE have received the "Year Book of New South Wales," which contains much useful information intended mainly for those wishing to settle in the country. The history, physical features, soils, minerals, water-supplies, trade and commerce, crown lands and many other subjects are dealt with.

THE Yorkshire Geological and Polytechnic Society gives abundant evidence of its flourishing state in the last number of its *Proceedings* (new series, vol. xiv. part ii.), which contains no less than twelve papers and twenty-eight plates. We are glad to note a contribution from the pen of Prof. McKenny Hughes, on the physical geography of the district around Ingleborough. There are papers on glacial drift, on Carboniferous fishes and other subjects, and we may call special attention to a "first paper," by Mr. Robert Kidston, on the flora of the Carboniferous period, illustrated by thirteen excellent photographic plates of coal plants. There is also a memoir, accompanied by a portrait, of the late Mr. W. Percy Sladen.

In Appendix iv. to the *Kew Bulletin* is given a list of the staffs at the Royal Botanic Gardens, Kew, and at such other botanical establishments at home, in India and the Colonies as are in correspondence with Kew.

NO. 1697, VOL. 66]

WE have received the sixth set (reduced copies) of Blackie's South Kensington drawing cards, which portrays "plant forms" in the shape of leaves, fruits and flowers. Each full-sized set consists of twenty cards, measuring 28 x 20 inches. As the previous set deals with advanced ornament, the present series might with advantage have been more complex; also the comparison of the natural object and the same conventionally treated would have been instructive. As the reduced copies present the objects full size, it would be possible to combine the natural and the conventional on the same card without unduly diminishing the proportions.

THE bibliography of the literature of psychology and cognate subjects, issued annually under the title of the "Psychological Index" by the *Psychological Review*, is a very serviceable publication. The index for 1901, compiled by Prof. H. C. Warren, with the cooperation of Messrs. J. L. des Bancelles, L. Hirschlaff, C. D. Isenberg and W. H. R. Rivers, has just been received, and it contains an orderly and comprehensive catalogue of French, German and English psychological publications issued during the year. There are nearly three thousand titles.

THE third edition of Prof. Erdmann's comprehensive "Lehrbuch der anorganischen Chemie" has been published by Messrs. F. Vieweg and Son, Brunswick. The original work was reviewed in these columns nearly three years ago (vol. ix. p. 289), and the new edition does not differ materially from it, though its value has been increased by revision and by the addition of about thirty new pages—bringing the total number up to 788 pages. The first part of the book is concerned with elementary chemical principles and methods, the second with non-metallic elements and the third with the metals. A long section at the end deals with the periodic law and some aspects of physical chemistry.

THE additions to the Zoological Society's Gardens during the past week include a Sooty Mangabey (*Cercocebus fuliginosus*) from West Africa, presented by Miss Frost; a Long-eared Owl (*Asio otus*) European, presented by Miss Kate M. Hall; two Kestrels (*Tinnunculus alaudarius*) British, presented by Mr. Austin; a Black Francolin (*Francolinus vulgaris*) from the Coast of Syria, presented by Commodore Winsloe, H.M.S. *St. George*, a Short Python (*Python curtus*) from Borneo, presented by Mr. L. Wray; a Macaque Monkey (*Macacus cynomolgus*), a Bungoma River Turtle (*Emyda granosa*) from India, two Grey Monitors (*Varanus griseus*) from North Africa, a — Anaconda (*Eunectes notoensis*), a Western Boa (*Boa occidentalis*) from Paraguay, ten Tessellated Snakes (*Tropidonotus tessellatus*), two Dahl's Snakes (*Zamenis dahli*), a Leopardine Snake (*Coluber leopardinus*), three Esculapian Snakes (*Coluber longissimus*), a Lacertine Snake (*Coluber monspessulana*), a Dark-green Snake (*Zamenis gemonensis*) European, a Pel's Owl (*Scotopelia peli*) from Africa, a Many-zoned Hawk (*Melierax polyzonus*) from Morocco, deposited; a Brown Capuchin (*Cebus fatuellus*) from Guiana, ten Common Teal (*Querquedula crecca*) European, a Black-pointed Tequexin (*Tupinambis nigropunctatus*) from South America, purchased; a Barbary Wild Sheep (*Ovis tragelaphus*), two Mouffions (*Ovis musimon*), a Rufous-necked Wallaby (*Macropus ruficollis*) born in the Gardens.

OUR ASTRONOMICAL COLUMN.

CHANGES ON THE MOON'S SURFACE.—That the moon is a dead planet, devoid of water-vapour and air and consequently lacking any form of life, either of the animal or vegetable world, has long been the belief of astronomers. New light upon the history of our satellite is, however, beginning to dawn, and it seems that the imagination of Mr. H. G. Wells, which illustrated so vividly the seasonal changes on the moon's surface and the appearance of vegetation of rapid growth, is supported by actual

"results of observation," judging from an interesting article by Prof. William H. Pickering in the May number of the *Century Magazine*. Messrs. Pickering and Percival Lowell have during the last few years made numerous excellent observations on the planet Mars, and they have greatly increased our knowledge by accurately observing the surface markings and suggesting very plausible explanations of the phenomena observed. Such work was rendered possible by erecting an observatory in a locality where observing conditions were as near perfect as possible. Prof. Pickering has more recently turned his attention to an examination of the lunar surface, and the first results of this work have led him to some very definite and striking conclusions. The first of these is that there seems to be strong, if not fairly conclusive, evidence in favour of the idea that volcanic activity has not yet entirely ceased, and he quotes several instances in which small craters have disappeared while others have sprung up in different regions. The second, and perhaps more startling, announcement is that there is snow on the moon. He has observed that many craterlets are lined with a white substance which becomes very brilliant when illuminated by the sun, and a similar substance is found on the larger lunar craters and a few of the higher mountain peaks. The curious behaviour of these patches under different angles of illumination and their change of form have led him to suggest that an irregularly varying distribution of hoar frost may have something to do with the changes observed. The third remarkable deduction refers to the observations of "variable spots," which appear to be restricted between latitudes 55° north and 60° south; these spots are always associated with small craterlets or deep narrow clefts, and are often symmetrically arranged around the former. The alterations which these undergo have led him to seek the cause in the change in the nature of the reflecting surface, and the most simple explanation according to him is found in assuming that it is organic life resembling vegetation, but not necessarily identical with it. The new selenography consists, therefore, as Prof. Pickering remarks, "not in mere mapping of cold dead rocks and isolated craters, but in a study of the daily alterations that take place in small selected regions, where we find real, living changes, changes that cannot be explained by shifting shadows or varying librations of the lunar surface." Prof. Pickering illustrates his article with numerous excellent and instructive drawings and photographs of portions of the lunar surface, and these give the reader a good idea of the changes referred to in the text.

DUST-FALLS AND THEIR ORIGINS.¹

FALLS of dust on a large scale are of rare occurrence, but one very often hears that in the south of Europe at such and such a place rain had fallen and had brought with it, and deposited on the ground, fine red or yellow dust. Thus on April 24, 1897, a south wind carried to southern Italy a great quantity of dust which was supposed to be of African origin.

Perhaps the most well-known instance of a fall on a large scale was that which occurred in May and August in the year 1883, when an enormous quantity of dust was hurled into the air during the Krakatoa eruption, and fell and was collected at various distances, the greatest being more than 1100 miles from the seat of the disturbance. The tremendous height to which the finer particles of dust were thrown, coupled with the movement of the air at this great distance from the earth's surface, were responsible for the magnificent coloured sunsets which were observed nearly all over the world. The volume² in which all these observations were collected is undoubtedly one of the most complete records of a "fall of dust" that has been published.

The large number of meteorological stations situated over the greater portion of the civilised world give us now greater chances for recording and tracing the paths of these falls of dust, whether they reach the earth's surface with or without the aid of rain. Fortunately, the tracks of the great dust storm of March 9-12 of last year and that of the minor storm of March

19-21 of the same year were restricted to such regions as these, passing over the coast of northern Africa and reaching Sicily, Italy, Austro-Hungary, Prussia, part of Russia, Denmark and even the British Isles.

In the volume before us, Profs. Hellmann and Meinardus have brought together all the information that could be collected by means of the distribution of circulars and communications with all meteorological stations, and discussed them in a very thorough and able manner, presenting us with a complete story, describing the locality from which the dust came, the means, direction and mode of transport, and finally the places over which it was deposited. The arrangement of the discussion is as follows:—The distribution of the dust over the land surface is first described, accompanied by the original accounts of the phenomenon as observed, a list of all places where the fall was recorded, and a map showing the general distribution. The meteorological conditions from March 9-12 are next dealt with, giving full details of the general atmospheric disturbances over the whole of Europe and North Africa, with numerous maps. The authors then give the individual reports on all the microscopic and chemical analyses of the dust from various localities, concluding with a brief account of the second fall of dust from March 19-21 and a general summary of the main results to which they have been led.

In these chapters the discussion of the facts collected has led the investigators to form a very concrete survey of the whole phenomenon, tracing the origin of the dust to dust-storms that occurred on March 8, 9 and 10 in the desert El Erg, situated in the southern part of Algeria, and which carried the dust and transported it northward.

This dust, as is here pointed out, began to fall at Algiers and Tunis in the dry state on the night of the 9th. The subsequent falls gradually took place northwards, first Sicily, then Italy, the Alps, Austro-Hungary, Germany, Denmark and European Russia, practically in the order named, coming in for their share. In Sicily and Italy the dust was noticed to have fallen even without the aid of rain, but in the other countries it was only detected during and after showers.

Not only did the dust-fall occur in these countries in the sequence mentioned, but the quantity that fell became gradually less the more north the places were situated, and the fineness of the dust, as shown by the analyses, increased at the same time. All these facts, as the authors indicate, are strong arguments in favour of the progress of the dust deposition from south to north, and the very minute and careful examination of the meteorological conditions stated here, showing a depression moving from south to north, endorse this point of view. There is little doubt, therefore, that the locality from which the dust originated was situated somewhere south of the northern shore of the African continent.

It is interesting to notice that the dust was not distributed homogeneously over the land areas, but in patches and streaks, some places, such as, for instance, the greater part of south Germany and Russian Poland, being entirely free from it, while others, such as the southern side of the eastern Alps and Holstein, being specially dense. The unequal distribution and different values for the rate of movement of the dust cloud seem to be adequately explained by the variable velocity of the air currents and the changing position of the barometric depression.

The investigation suggests that the dust was carried by a large mass of air which moved with great velocity from northern Africa to the north of Europe, and that this mass of air, cyclonic in nature, was fed on its western side by air currents from the north and on its eastern side by southerly currents; this accounts for the observed facts that the fall of dust was chiefly limited to the eastern portion of the depression.

As regards the total amount of dust that fell to the surface, rough estimates indicated that the weight of it would amount to about 1,800,000 tons, two-thirds of which were deposited to the south of the Alps.

The authors have shown that the most probable origin of the dust was the region to the south of Algeria, so that an examination of the dust that fell in Europe and elsewhere should consist of similar components as those that form the dust of this region. Nearly all the mineralogical, microscopic and chemical analyses point out that the dust is neither volcanic nor cosmic, but simply such as is found on the African continent. From exactly which part of the continent it came is evidently not certain, for some mineralogists suggested that the dust consisted

¹ "Der grosse Staubfall von 9 bis 12 März, 1901, in Nordafrika, Süd- und Mitteleuropa." Von G. Hellmann und W. Meinardus. *Abhandlungen des Königlich Preussischen Meteorologischen Institut*, Bd. ii. No. 1. (Berlin: A. Asher and Co., 1901.)

² "Report of the Krakatoa Committee of the Royal Society." (London: Trubner and Co., 1883.)