

although himself unable to verify the existence of the radiations, adversely criticises Prof. Wood's objections. M. Weiss, from his failure to observe the rays, simply concludes that he was physically unfitted for such observations.

PART xii. of the *Transactions* of the Royal Dublin Society consists of an investigation by Mr. Richard J. Moss of the state in which helium exists in pitchblende. The total quantity of helium in a sample of pitchblende was 0.107 c.c. per gram, and of this 1.17 per cent. was liberated by simply grinding the mineral in a vacuum. The quantity of carbon dioxide separated by completely decomposing the mineral was 4.686 c.c. per gram, of which only 0.0085 per cent. was obtainable by grinding. As a similar proportion of the total occluded carbon dioxide can be separated from calcite, in which the gas is undoubtedly present in minute cavities, by simply pulverising the crystals, it is probable that the whole of the carbon dioxide of pitchblende, and possibly the helium also, are present similarly occluded. It is evident that the proportion of the gases liberated by roughly grinding must necessarily be only a small proportion of the total volume.

THE Christmas number of *Photography*, published by Messrs. Iliffe and Sons, Ltd. (1s. net), is restricted to many kinds of work with the camera which can be accomplished indoors during the winter months. It might be said further to deal with the lighter side of photography as well, as will be judged by reading the second portion of this number. Part i., by Mr. C. J. Harrison, deals with the working up of negatives and prints for the removal of mechanical and other defects from negatives. The methods and dodges employed are, as the author states, the outcome of his own experience, but nevertheless they are interesting reading, and may prove serviceable to many photographers. The illustrations accompanying the text and chosen to represent various stages of these methods are also well worth examination. In part ii. Mr. W. L. F. Wastell discourses on bye-paths of photography. Here the reader is made acquainted with methods for producing what may be termed "freak" photographs. Thus we have illustrated examples of the so-called "spirit" photograph, distortions due to the object being too near to the camera, two images of the same person in one picture, combination portraits, silhouettes, and many others of a similar character. The supplement to this number consists of designs, covering sixteen pages, of photographic mounts to serve as Christmas cards.

THE articles in the October number of the Johns Hopkins Hospital *Bulletin* (xv., No. 163) are mainly of medical interest. Dr. Packard, however, writes an interesting account of some famous quacks, including Valentine Greatrakes, who claimed the healing touch for the King's evil in the seventeenth century, no other than Robert Boyle testifying to his powers; Joshua ("Spot") Ward, who discovered a cheap way of making oil of vitriol; and John St. John Long, who devised a famous liniment which possessed not only curative powers, but also revealed hidden disease, and from his practice is said to have derived 13,000l. a year.

MR. W. B. CLIVE has published a revised and enlarged edition of "First Stage Building Construction," by Mr. Brysson Cunningham.

MESSRS. DAWBARN AND WARD, LTD., have published in their "Home Worker's" series a booklet by Mr. R. H. S. Williams with the title "How to Build a Bicycle," and one on "How to Build a Petrol Motor," by Mr. J. F. Gill.

THE separate parts (parts i.-vi.) of "A School Geometry," by Messrs. H. S. Hall and F. H. Stevens, which have been reviewed in these columns from time to time, have been published together in one volume by Messrs. Macmillan and Co., Ltd., at 4s. 6d.

A FOURTH edition of Prof. Olof Hammarsten's "Text-book of Physiological Chemistry" has been published by Messrs. John Wiley and Sons, New York (London: Messrs. Chapman and Hall, Ltd.). This issue is an authorised translation by Prof. John A. Mandel from the author's enlarged and revised fifth German edition.

THE 1904 issue of the "Year-book of the Scientific and Learned Societies of Great Britain and Ireland" has now been published by Messrs. Charles Griffin and Co., Ltd. This is the twenty-first annual issue of a useful list of organisations for the advancement of science, literature, and art, and of work done year by year. Comprehensive as the compilation is, it is not quite complete, for there appears to be no reference either to the Sociological Society or to the Geographical Association.

Erratum.—In the inscription of Fig. 5 (p. 135) of the article on "Invar" in last week's NATURE, "a 2 km. wire" should read "a 24 m. wire."

OUR ASTRONOMICAL COLUMN.

RELATIONS BETWEEN SOLAR AND TERRESTRIAL PHENOMENA.—In a paper communicated to the Royal Society of New South Wales, Mr. H. I. Jensen, of Sydney University, discusses the more recent data concerning sun-spot frequencies and the occurrence of volcanic outbursts, earthquakes and climatic variations, with the view of illustrating further the dependence of the terrestrial upon the solar phenomena.

In a previous paper communicated to the same society in June, 1902, he arrived at the conclusion that the maxima of volcanic and seismic activity coincided, in point of time, with the sun-spot minima, but the discussion of the later data has led him to a confirmation of the views expressed by Sir Norman Lockyer, viz. that the maximum activity of the terrestrial takes place at both the minima and the maxima of the solar phenomena. His observations show, however, that the action at sun-spot maxima is less marked than, and of a different character to, that which takes place at the minima.

The differential action of lunar attraction is also discussed, and although the author concludes that this cause is only one of secondary importance, he shows that volcanic outbursts and earthquakes seem to occur most frequently at those times when the moon is in perigee.

In discussing the connection existing between solar and meteorological variations, Mr. Jensen refers to the work performed in this direction by Sir Norman and Dr. Lockyer, and in general agrees with their results, although he inclines to the belief that the epochs of sun-spot maxima are generally the epochs of excessive rainfall. Further, he strongly insists upon the necessity of attaching more importance to geographical position when considering the prevailing meteorological conditions of any place (*Proc. Roy. Soc. New South Wales*, vol. xxxviii.).

SUN-SPOT SPECTRA.—In No. 4, vol. xx., of the *Astro-physical Journal* Father Cortie brings together the results of all the sun-spot spectra observations made at the Stonyhurst College Observatory during the period 1883-1901.

Using a Browning automatic spectroscope containing twelve 60° prisms, the widened lines in the region B-D of the solar spectrum were picked out, and the intensity of their relative widening recorded on an arbitrary numerical scale. The present catalogue results from 5486 individual observations of 349 lines, and the results generally confirm the observations made at South Kensington as recorded by Sir Norman Lockyer in a paper ("On the Relation between the Spectra of Sun-spots and Stars") recently communicated to the Royal Society, viz. that vanadium and titanium are the elements chiefly affected in sun-spot spectra.

Father Cortie states that the widening of some oxygen lines in sun-spot spectra, particularly in the α band, seems to be a real phenomenon.

ECLIPSE OBSERVATIONS.—Vol. iii. of the *Annalen* of the Royal University Observatory of Strassburg, edited by Dr. E. Becker, the director, contains the results of the heliometer observations of the total solar eclipse of May 28, 1900, and of the lunar eclipses which took place on January 28, 1888, May 11, 1902 (partial eclipse), and April 11, 1903, respectively.

In the first part Prof. Kobold gives the results of a number of observations made in order to determine the reduction elements of the heliometer, and then applies them to the observational results obtained during the solar eclipse of 1900. Finally, he gives the corrections to the previously determined positions. In part ii. the same observer discusses the observations of the 1888 and 1892 eclipses of the moon, and gives the values obtained for the radius of the earth's shadow, &c., finally comparing them with the calculated values.

In the third part Herr C. W. Wirtz discusses the observations of the lunar eclipse of April 11, 1903, including the corrections to the moon's place, the figure and size of the earth's shadow, and the variations of the diameter of the crater Linné during the eclipse. The curve on which are plotted the values of the last named quantity shows a considerable increase in the diameter during the approach of the earth's shadow to the crater, the maximum value evidently occurring during the actual eclipse of Linné.

THE APPEARANCE OF SPARK LINES IN ARC SPECTRA.—An interesting discussion of the conditions which lead to the appearance of "spark" lines in arc spectra is published in No. 4, vol. xx., of the *Astrophysical Journal* by Dr. Henry Crew, of the North-western University, Ill. Dr. Crew made a number of experiments in which the Mg line at λ 4481 appeared in the arc spectrum, and examined the arc, simultaneously, with a Rowland grating spectrograph and a Duddell high-frequency oscillograph.

The various conditions under which the arc was produced were as follow:—(1 and 2) current with negligible and with large amount of inductance respectively; (3) arc broken by air blast; (4) arc in atmosphere of coal gas.

The reproductions of the oscillograph curves show the current conditions during each experiment, and from a discussion of the results Dr. Crew arrives at the following conclusions:—(1) A rapidly changing, high E.M.F. is a probable *conditio sine qua non* for the appearance of spark lines in arc spectra. (2) The effect of hydrogen and other atmospheres in introducing spark lines is explained by the fact that these atmospheres produce a more rapid break, and this, in turn, introduces an extra E.M.F., which in some way, as yet unknown, is responsible for the radiation of the spark line. A possible explanation of the stellar conditions which produce spark lines in the spectra of stars is also discussed.

THE ROYAL ASTRONOMICAL SOCIETY OF CANADA.—Founded as the Astronomical and Physical Society of Toronto, the name of this society was changed in 1900 to that of the Toronto Astronomical Society. In 1903 it was decided to change its name to the Astronomical Society of Canada, and in response to a petition the privilege of prefixing the word "Royal" to its name was granted, so that the full title of the society is now the above heading. We hope that this new national society will be a stimulus to the promotion and diffusion of astronomical science, and that its influence will be greatly extended. We have before us the volume containing the selected papers and proceedings for the years 1902 and 1903, edited by A. Harvey; the varied topics there dealt with bid fair for the future of the society. Among some of the papers may be mentioned the address of the president, R. F. Stupart, director of the Magnetic and Meteorological Observatory of Toronto, in which is an account of the history and work of the institution. W. H. S. Monck gives a catalogue of aërolites, arranged in order of the months in which they fell. There is a brief account of the present astronomical equipment of Canada as a whole, and a discussion on papers dealing with solar phenomena and terrestrial effects. The volume concludes with an account of women's work in astronomy, by Miss E. A. Dent.

THE FIRST TRUE MAPS.

IN the history of cartography, in the development of maps and map-making, there is perhaps nothing quite comparable to the first appearance of the "portolani" or "handy charts" at the close of the thirteenth and the beginning of the fourteenth century. For the portolani, the first true sea-charts, are also the first true maps of any kind—the earliest designs in which any part of the earth-surface is laid down from actual observation of close and continuous character.

By the term "portolani" we intend, of course, to refer to that great series of coast-plans of which the earliest known examples belong to the first decade of the fourteenth century (A.D. 1300–1310); which are traceable to a very few, perhaps to two or three (now lost), originals; which may be extended to cover at least 500 designs (reaching down to the end of the sixteenth century); and were primarily intended to serve as practical guides to mariners and merchants in the seaports of the Mediterranean and Black Sea.

These plans of practical navigators—of men whose livelihood largely depended on their knowledge of nature and their close observation of natural features—are a remarkable contrast, in their almost modern accuracy, to the results of the older literary or theological geography as we have them in the Hereford or Ebstorf maps (both of the very same period as the oldest existing portolans, c. A.D. 1300). They have never yet received adequate attention from English geographers (as from Nordenskjöld the Swede, Fischer the German, or Uzielli the Italian), and the problem of their sudden appearance in such comparative perfection is surely deserving of more study, and capable of fuller explanation, than it has yet received. Certain assumptions may perhaps be made without danger. The portolano type was not the invention of one man, of one year, of one decade. It did not spring from any school or any example of mediæval student-map. It was the final result of centuries' experience—the outcome of the notes, plans, and oral tradition of generations of pilots and captains. Skipper-charts of certain important and much-frequented sections of the coast trade-routes were probably combined, by slow degrees, into a coast-chart of the Mediterranean basin as a whole. It may be that the sketches of small portions of shore-line which we have in fifteenth century manuscripts of Leonardo Dati's poem "La Sfera" are really copies, but slightly modified, of such old skipper-charts—reaching back, perhaps, to the eleventh century, and forming the very earliest indications of that new scientific geography in which the compass played so great a part. If this surmise is correct, the opening of the mediæval Renaissance, in the generations immediately preceding the Crusades, was accompanied by the oldest embryonic forms of modern cartography.

Once more, it may be that the sea-chart which is mentioned in connection with the Seventh Crusade (of A.D. 1270), and which St. Louis apparently employed to aid his attack on Tunis, was a portolan, or a sectional chart of the North African coast of portolan type. It may be that the *charta* noticed in Raymond Lulli's "Arbor Scientiæ" (about A.D. 1300) as necessary for sailors—along with the compass, needle, and "star of the sea"—was a work of the same kind. It may be that Andrea Bianco's planisphere of 1436 is a re-edition of a "handy-map" of the thirteenth century. But the oldest certain examples of the type we are concerned with, which have been discovered up to the present, are the *Carte pisane* and the first design of Giovanni de Carignano, both belonging to the opening years of the fourteenth century, while the oldest dated portolan is the first of Pietro Vesconte (or Visconti), executed in 1311.

And when, with these and the next few examples, we get at last our full coast-chart of the Mediterranean basin, what is its character?

It is a map without graduation, embracing only the coast lines and the towns and natural features in the immediate neighbourhood of the coast. But though it is restricted, it has extraordinary merits in its own field. Its delineation of the shores of the *Mare Internum*, from the Straits of Gibraltar to the extreme east of the Black Sea, is markedly superior to anything of earlier date—even to the Madaba