and Art. The books contain some useful hints to intending examinees, and answers to questions that have been set at the Departmental examinations. A number of test-papers in mathematics, arranged by Mr. R. Roberts, has also just been published by Messrs. Blackie.

" LA Terre avant l'apparition de l'Homme " (MM. Baillière et Fils) is a bulky tome by Prof. F. Priem, in Brehm's *Merveilles de la Nature* series. In it the author recounts the numerous changes through which our globe has passed in geological time. He describes the distribution of land and water during the well-marked periods of this world's history, and deals particularly with the fauna and flora of bygone days. In the latter half of the work, the geology of France is dealt with in a very detailed manner. The book is *au courant* with recent investigations in geology and palæontology; it contains 850 figures illustrating fossils, geological sections, picturesque regions and interesting formations, and is worthy of a high place in the fine series to which it belongs.

During the last few months we have had the pleasure of commenting upon several chatty books on natural history matters—books in which instruction is happily combined with interest. Another volume of a similar kind, " Random Recollections of Woodland, Fen, and Hill," by Mr. J. W. Tutt (Swan Sonnenschein and Co.), has recently been published. We recommend the book to the nature-lover and entomologist because it contains a large amount of information brightly put and generally accurate; and all who can appreciate the beauties of natural creatures and things would do well to read it.

A VERY important collection of works is being offered for sale by Messrs. W. Wesley and Son. We refer to the Paracelsus Library of Dr. E. Schubert, who died at Frankfort-on-the-Main in 1892. The library contains 194 editions of the writings of Paracelsus, 548 works which partly or chiefly treat of Paracelsus, description of his times and the places where he worked, publications of his friends and opponents, and a selection of 351 works on alchemy. Altogether this unique collection comprises about eleven hundred books, manuscripts, portraits, and tracts, and it is richer in original editions of Paracelsus than that of the British Museum. It is satisfactory to know that no part of the library will be disposed of separately, with the exception of the portion on alchemy.

AN investigation of the mechanics of the interaction of ethyl alcohol and hydrogen chloride is communicated from Prof. Lothar Meyer's laboratory to No. 12, 1893, of the *Zeitschrift für physikalische Chemie* by Mr. Cannell Cain. Solutions of hydrogen chloride of different strengths were obtained by leading the dry gas into the dry alcohol, which was coated by a freezing mixture. A definite quantity of such a solution was then sealed up in a small glass tube, and kept for a definite length of time at a constant temperature in a water bath. The composition of the solution before and after the interaction was ascertained by titrating a known amount with dicinormal soda solution. The results show that concentration and time of reaction being the same, the extent of the chemical change increases rapidly with the temperature. Up to 15° there is no appreciable interaction, but in a solution containing 100 equivalents of alcohol and 81 of hydrogen chloride at 80° some 15 per cent., and at 99° some 50 per cent. of the latter enter into combination in one hour. For a given temperature and concentration the amount of decomposition increases with the time at a rate which gradually diminishes, and finally becomes zero. Temperature and time of reaction being the same, it is also shown that increase in the quantity of alcohol in the above solution, or addition of water or ethyl chloride, retard the rate of change. By experiments with water and ethyl chloride the

author makes clear the reversible character of the action, and next makes observations to ascertain the relative proportions of the substances present when equilibrium is established. In these experiments various solutions of hydrogen chloride in alcohol, alone, and in presence of different amounts of water are employed. Here it is shown that Guldeberg and Waage's law is obeyed, as the product of the active masses of alcohol and hydrogen chloride bears a constant ratio to the product of those of water and ethyl chloride unless in cases where ethyl chloride separates out, and the solutions thus become heterogeneous. If the alcohol and hydrogen chloride be present in equivalent amounts the results indicate that the equation $C_2H_5OH + HCl + 3C_2H_5Cl + 3H_2O$ approximately represents the condition of things when equilibrium is attained.

IN the review of Mr. Richard Inwards' " Weather Lore," that appeared in these columns on January 4, p. 219, the author's attention was commended to a collection of " wise saws " made for the U.S. Signal Service by Major Dunwoody. Mr. Inwards points out to us that his book contains extracts from this collection, and that he acknowledges his obligations to it in the introduction. We regret that this acknowledgment was overlooked by the writer of the notice.

THE additions to the Zoological Society's Gardens during the past week include two Mozambique Monkeys (*Cercopithecus pygerythrus*) from East Africa, presented respectively by Mr. H. P. East and Mrs. Adams; two Common Marmosets (*Hapale jacchus*) from South-east Brazil, a Common Hamster (*Cricetus frumentarius*) European, presented by Mrs. Brightwen; two Jackdaws (*Corvus monedula*) British, presented by Miss Williams; a Clifford's Snake (*Zamenis Cliffordi*) from Egypt, presented by Mr. W. L. Tod; a Malaccan Parrakeet (*Palæornis longicauda*) from Malacca, deposited; a Snow Leopard (*Felis uncia*) from Lahoul, Punjaub, Himalayas, an Alpine Marmot (*Arctomys marmotta*) European, two Hairy Armadillos (*Dasypus villosus*), a Black-necked Swan (*Cygnus nigricollis*), two Rufous Tinamous (*Rhynchotus rufescens*), two Brazilian Caracaras (*Polyborus brasiliensis*), two Common Teguexins (*Tupinambis teguexin*), a Common Boa (*Boa constrictor*) from South America, a Melodius Jay Thrush (*Leucodioptron canorum*) from China, purchased; two Lapwings (*Vanellus vulgaris*), two Dunlins (*Tringa alpina*) British, received in exchange.

OUR ASTRONOMICAL COLUMN.

SUNSPOTS AND SOLAR RADIATION.—Spectroscopic observations, the discussion of the frequency of tropical cyclones, and cyclical variations of barometric pressure, indicate that the greatest amount of heat is received from the sun by the earth during a maximum epoch of solar activity. But, on the other hand, the discussions of statistics of air temperature and solar radiation suggest that that the sun's heat is greatest when his surface is least spotted. Some new facts in connection with this paradox are described by M. R. Savélief in the current *Comptes Rendus*, and seem to combat the latter result. He has made a large number of observations with a Crova's actinograph since June 1890, and compared them with the late Dr. Wolf's numbers showing the relative frequency of solar spots. A few observations are given indicating that the solar constant increases with the increase of solar activity. M. Savélief has also calculated the mean quantity of heat received on one square centimetre of horizontal surface on the ground during one day, and for an hour of solar radiation. The results obtained by this method, like those deduced from the solar constant, point to the conclusion that the calorific intensity of solar radiation increases with the activity of the phenomena visible upon the surface of the sun, that is to say, with the increase of solar spottedness. These results are diametrically opposed to those obtained by previous investigators (see NATURE, vol. xliii. p. 583), and, if they are confirmed, a real difficulty in the way of explaining the correlation of solar and meteorological phenomena will have been removed.

THE MEASUREMENT OF STELLAR DIAMETERS.—When the objective of a telescope is covered with a screen having two slits in it, the image of the object under observation takes the form of a series of fringes lying in the direction of the slits ; and every one with an elementary knowledge of physics knows that this appearance is due to the interference of the beams of light traversing the instrument. Fizeau appears to have been the first to point out that the size of the fringes depends upon the angular dimensions of the luminous source producing them, and that this fact might be utilised to determine stellar diameters. The means by which Prof. Michelson has applied the principle to the measurement of the diameters of Jupiter's satellites has already been described in these columns (vol. xlv. p. 160) ; but the subject is so important that we give here the gist of a discussion of the theory of the matter, contributed by M. Maurice Hamy to the number of the *Bulletin Astronomique* just issued. By means of Prof. Michelson's interferential refractometer—an instrument with a life of usefulness before it— it is possible to measure diameters down to 0″·01, that is, to the angle which the sun would subtend if it were removed to the distance of α Centauri. In fact, there is little doubt that the diameters of stars are measurable by this means. All that is necessary theoretically is to cover the object glass of the telescope with a screen having two rectangular, parallel slits, equal and of variable width. The interference fringes produced at the focus of the instrument are made to disappear by separating the slits, and when the fringes corresponding to light of a wavelength represented by λ have vanished, the distance (*l*) between the centres of the slits must be measured. The exact formula which enables the diameter (ε) of the object under examination to be determined from these data is, according to M. Hamy,

$$\epsilon = 1''\cdot 22 \frac{\lambda}{l \sin 1''}$$

There are, of course, a few difficulties in the way of perfectly realising the theory, but they are being overcome, and it is not too much to say that the interferential refractometer will add very considerably to astronomical knowledge before the end of this century. It would be interesting to measure the diameters of Algol, and some of the spectroscopic binaries, and compare the results with those deduced from observations of motion in the line of sight.

THE MOON AND WEATHER.—The solitary observable effect of the moon on our atmosphere was believed by Sir J. Herschel to be exhibited in the tendency of clouds to disappear under a Full Moon. He attributed this to the heat radiated from the lunar surface. Humboldt speaks of this connection as well-known in South America, and Arago indirectly supports the theory by stating that more rain falls about the time of New Moon than at the time of Full Moon ; the former period being cloudy, and the latter cloudless, according to theory. With the idea of obtaining information upon the matter, the Rev. S. J. Johnson has examined the state of the sky at moonrise and at midnight on the day of Full Moon only for the last fifteen years. His results were communicated to the Royal Astronomical Society on January 12, and they confirm the opinion now held by almost every astronomer, viz. that the Full Moon has no effect in breaking up clouds.

GEOGRAPHICAL NOTES.

MRS. BISHOP (Miss Isabella Bird) has set out *via* Canada for Korea, where she intends to spend some time studying the country, and whence she may afterwards make a journey into Manchuria.

THREE Christmas lectures to young people by Mr. Douglas W. Freshfield, were arranged by the Royal Geographical Society, and were delivered in the second week of January to an interested audience. The subject was mountain-study as a branch of geography, and the lectures were illustrated by a large collection of extremely fine photographic views of the Alps and Caucasus.

MR. H. J. MACKINDER commenced the second series of his lectures on the relation between geography and history, in pursuance of the Royal Geographical Society's Educational Scheme, on January 11, in the theatre of the Royal United Service Institution, Whitehall Yard. The lecture was introductory to the present course, which will be continued weekly, and consisted of an epitome of last year's lectures, showing that physical and geographical conditions largely determine the order of history and the movements of peoples. The remaining lectures will deal with a series of concrete examples, focussing the essential features of the relation between the geography and history of the chief countries of Europe, and especially of the British Islands.

THE *Zeitschrift* of the Berlin Geographical Society publishes an interesting paper, by Dr. Wegener, on the Chinese map of northern Tibet and the Lob-nor District, being a sheet of the official Chinese Atlas compiled by the labours of the Jesuit missionaries at the Court of Pekin, who trained and superintended Chinese surveyors. It was first published in 1718, and an enlarged edition appeared in 1863 extending over the greater part of Asia. This work still is the basis of the European maps of many parts of Tibet, and the careful index of names prepared by Herr Himly, which accompanies the report, is of extreme value, as, not content with the Chinese lettering, he has had recourse to the original Tibetan, Turki, and other native names, which he transliterates with great care.

AUGUST ARTARIA, the eminent Austrian map publisher, who has done much to maintain the character of scientific cartography, died at Vienna on December 14, 1893, aged 87.

MM. SCHRADER AND DE MARGERIE, whose long study of the geology of the Pyrenees is well known, have contributed to the last volume of the *Annuaire* of the French Alpine Club a concise discussion of the geographical conditions of the chain illustrated by a large-scale coloured orographical map. The denudation of the northern slope has been much more complete than that of the southern ; the tertiary strata remain on the latter, but on the French side have been eroded away to form the vast fans of alluvium of the lower plain. Despite their general form, the Pyrenees are not composed of ranges running east and west, but of mountain knots and short ranges oblique to the general direction running towards E. 30° S. and then turning towards E.N.E. as a rule. The mean altitude of the chain is about 1000 metres, or say 3300 feet. Elie de Beaumont, on the assumption that the southern slope was strictly similar to the northern, made his estimate of the mean height 500 metres greater. The mass of the Pyrenees, if spread over the surface of France, would raise the level of that country by 102 metres, or 330 feet.

A NEW SULPHIDE OF CARBON.

A NEW liquid sulphide of carbon of the composition C_3S_2 has been isolated in a somewhat remarkable manner in the chemical laboratory of the university of Buda-Pesth, by Prof. von Lengyel, who contributes an account of it to the current *Berichte*. In addition to the well-known disulphide of carbon, several other substances supposed to be compounds of carbon and sulphur have from time to time been described ; but as they appear to have been amorphous insoluble solids very difficult to purify, there is very little evidence of their being definite compounds. The substance now described, however, appears to be a very well characterised liquid compound of unmistakable odour and corrosive action upon the skin, and capable of being distilled under diminished pressure.

The method of preparing it was accidentally discovered during the elaboration of a number of lecture experiments illustrating the synthesis and decomposition of carbon disulphide. It was long ago pointed out by Berthelot that this familiar substance decomposes at a temperature but slightly higher than that at which its formation from its constituents occurs. Buff and von Hofmann subsequently showed that the temperature of a glowing platinum wire was ample to bring about slow dissociation of the vapour, and that the disruption of the compound occurred very rapidly indeed at the temperature of red-hot iron wire. An experiment was therefore arranged to ascertain whether rapid removal of the vapour of the synthesised compound from the heated sphere of action would largely prevent the loss by dissociation, and in order that the test should be a severe one, the rapidly moving vapour was subjected in its passage to the high temperature of the electric arc. It was during this experiment that the new sulphide of carbon was unexpectedly produced.

A little more than a hundred cubic centimetres of carbon