THE *Century Magazine* for January contains an illustrated article on radium by Prof. E. Merritt, and one on radium and radio-activity by Mme. Curie. The extraction and properties of the new element are also described in the *Strand Magazine*, in the course of an illustrated interview with M. Curie.

THE bound volume for 1903 of *Knowledge*, which has now been published, makes a very attractive book. It is profusely illustrated, and, as usual, the astronomical plates are particularly good. The magazine has just been incorporated with the *Illustrated Scientific News*, and the combined journal will be published under the joint title of *Knowledge and Illustrated Scientific News*.

THE second part of vol. ii. of "The Fauna and Geography of the Maldive and Laccadive Archipelagoes," being the account of the work carried on and of the collections made by an expedition during the years 1899 and 1900, has been published by the Cambridge University Press. This part, edited by Mr. J. Stanley Gardiner, contains the following three reports:—marine mollusca, by Mr. Edgar A. Smith; the Enteropneusta, by Mr. R. C. Punnett; and marine Crustacea—the spider-crabs (Oxyrhyncha) and the classification and genealogy of the reptant decapods—by Mr. L. A. Borradaile. The third part of vol. ii. is to be published on May 15.

WE have received the second series of vol. viii. of the "Proceedings and Transactions of the Royal Society of Canada," and notice that it contains a full account of the twenty-first general meeting held at Toronto in May, 1902. The presidential address, by Sir James A. Grant, K.C.M.G., had for its subject the universities in relation to research, and constitutes the first appendix to the first part of the volume, which includes the *Proceedings*. The second appendix contains reports from twenty-seven associated literary and scientific societies in Canada, some of the reports being in French. Similarly the section of the *Transactions* dealing with French literature, history, and archæology is given in French. Among papers read before the section concerned with the mathematical, physical, and chemical sciences may be mentioned:—On the stresses developed in beams loaded transversely, by Prof. H. T. Bovey, F.R.S.; researches in physical chemistry carried out in the University of Toronto during 1901–2, by Prof. W. L. Miller; on the existence of bodies smaller than atoms, by Prof. Rutherford; on the absolute value of the mechanical equivalent of heat, by Prof. H. T. Barnes; and the specific heats of organic liquids and their heats of solutions in organic solvents, by Dr. J. W. Walker and Dr. J. Henderson. In the section of the geological and biological sciences twelve papers are included, and among them are two by Prof. D. P. Penhallow on *Osmundites skidegatensis* and notes on Cretaceous and Tertiary plants of Canada. Dr. G. F. Matthew contributes notes on Cambrian faunas, and Prof. A. P. Coleman discusses the classification of the Archæan. The volume contains numerous well executed illustrations, and is an excellent witness to the value of the work in science which is being accomplished in Canada.

THE determination of the density of chlorine gas is attended with many experimental difficulties, and the figures obtained by different workers vary between 2·448 and 2·491. In the current number of the *Comptes rendus* MM. H. Moissan and Binet du Jassoneix describe their researches on this subject. Three groups of experiments are given, involving seventeen determinations, and the final figure regarded as the most probable is 2·490 at 0° C., a value identical with the figure of Leduc. The chief sources of error to be eliminated are the presence of air in the density flask, the difficulty of completely drying the gas, and the solubility of different gases in liquefied chlorine.

IN a recent number of the *Comptes rendus* it is stated by M. Becquerel that when crystals of hexagonal zinc blende are crushed between glass plates they emit a flash of light comparable with that which is produced by the proximity of a radium salt in Crookes's spinthariscope. It is suggested that in the latter case the positively charged α-particles fracture by their impact the surface of the blende, and that the flashes of light observed are thus caused by a mechanical action on the screen.

THE origin of natural asphalte or bitumen has given rise to much speculation, and the suggestion has been made that it is produced by the destructive distillation of vegetable remains mixed with organic matter, and especially with fish. Another possible explanation is suggested by the production of an artificial asphalte by heating natural petroleum with sulphur. The series of paraffins is not affected by this treatment, but the naphthenes which are present in the petroleum undergo condensation and give rise to bodies which may be regarded as typical constituents of asphalte. Two of these, prepared by the action of sulphur on acenaphthene, $H_6\begin{smallmatrix}CH_2\\|\\CH_2\end{smallmatrix}$, have recently been described by Karl Dziewonski in the *Berichte*. The first is a hydrocarbon, $C_{36}H_{18}$ (trinaphthylene benzene), melting at 387° C., which contains no less than ten independent ring systems, and is therefore named decacyclene, whilst the second is a sulphur-compound, $C_{24}H_{12}S$ (dinaphthylenethiophen), melting at 278° C.

THE additions to the Zoological Society's Gardens during the past week include a Mozambique Monkey (*Cercopithecus pygerythrus*) from East Africa, presented by Lady Amherst; a Patas Monkey (*Cercopithecus patas*) from West Africa, presented by Mr. F. A. Knowles; a Lesser White-nosed Monkey (*Cercopithecus petaurista*) from West Africa, presented by Mr. G. A. Hanton; a Black-backed Jackal (*Canis mesomelas*) from South Africa, presented by Captain Moseley; a Hairy-rumped Agouti (*Dasyprocta prymnolopha*) from Central America, presented by Mr. John Gordon; two Ring-tailed Coatis (*Nasua rufa*) from South America, presented respectively by Mr. H. Everest and Mr. D. F. Mackenzie; a Water Rail (*Rallus aquaticus*), British, presented by Mr. F. W. Pizzey; a Californian Sea Lion (*Otaria californiana*) from the North Pacific Ocean, seven Indian Fruit Bats (*Pteropus medius*) from India, deposited.

OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL CALENDARS FOR 1904.—The "Annuaire du Bureau des Longitudes" for 1904 contains more than 700 pages of useful tables and formulæ, astronomical and physical, including lucid explanations of such matters as the several different calendars, the tides, &c. A new arrangement is inaugurated in this year's publication; instead of giving the customary complete set of tables, &c., only those relating to astronomy, physics, and chemistry are included, and it is proposed to omit the chemistry and physics next year, giving instead full sets of tables relating to general geography, meteorology, and statistics. This alternation will be continued in future "Annuaires."

The "Annuaire astronomique et météorologique," compiled by M. Camille Flammarion, attains its fortieth year of publication in the issue for 1904. It gives a complete account of the astronomical occurrences due this year, and a useful review of the astronomical and meteorological

phenomena of recent years. The current issue contains many illustrations, among which are some good reproductions of photographs and drawings of sun-spots, comets, and planetary features observed during 1903. The charts of the sky and the particulars of interesting phenomena, which are given for each month, will be found very useful by all who are engaged in practical astronomy. The "Annuaire" is published by M. Ernest Flammarion, 26 Rue Racine, Paris, at 1.50 francs (about 1*s.* 3*d.*).

The card calendar issued by Mr. Arthur Mee, of Llanishen, under the title "The Heavens at a Glance" contains a very complete set of the tables and a great deal of the information required by an amateur practical astronomer. Being printed on a single stiff card, suitable for hanging on the observatory wall, it is exceedingly handy to use as a source of reference for current astronomical occurrences. Amongst other information the card contains a list of the principal meteor showers, with concise instructions to observers, ephemerides of the planets and lists of double stars, variables and nebulæ. It may be obtained from Mr. Mee, at the above address, for 7*d.* post free.

THE VARIABLE STAR 1921, W AURIGÆ.—In No. 5, vol. xviii., of the *Astrophysical Journal*, Mr. J. A. Parkhurst, of the Yerkes Observatory, gives the details and results of a series of observations of the variable star W Aurigæ, made by him during the period December, 1898–March, 1903. He determined the position of the variable (for 1900) as R.A. = 5h. 20m. 8·6s., $\delta = +36^\circ\ 48'\ 53''$, and found that the magnitude varied from 9·3 at maximum to 13·8 at minimum. The strong colour of this variable is indicated by the fact that when the visual magnitude was 9·5 the photographic magnitude was only 10·9.

The variations are best represented, according to the curves which Mr. Parkhurst has plotted from his observations, by the following elements :—

Max. = J.D. 2414648 + 276 E.
or December 24, 1898 + 276 E.,

the interval, M–m, being 113 days.

LIGHT ECONOMY IN SPECTRUM PHOTOGRAPHY.—In a paper communicated to the current number of the *Astrophysical Journal*, Mr. J. A. Humphreys describes a number of arrangements used by him in photographing spectra for utilising to the full the light obtained from the light source under examination. He has found that the most generally convenient and effective arrangement, when terrestrial light sources are being used, is to place a spherical reflector behind the source so that the focus of the reflected light coincides with the origin. In this way both the reflected and direct light are utilised, and are together focused on the slit by an ordinary condenser. Comparison photographs, which are reproduced in the article, show that the light reflected through the source suffers but little from absorption, and that the net result of using this arrangement is to obtain lines which would otherwise be too weak to photograph, and to strengthen the weaker lines.

Another method, which may be used with any source when a grating is used as analyser, is to place a pair of inclined plane reflectors between the slit and the grating so that the rays from the top and bottom of the slit are reflected on to the centre of the grating, thereby condensing the light from the whole length of the slit into a narrower plane, and so obtaining a stronger spectrum. In another, but somewhat similar, form, the two plane reflectors are placed near to the photographic plate, so that the parallel rays from the top and bottom of the grating are superimposed upon the rays from the centre. It is found that when long-focus gratings are used the slight lengthening of the path of the rays by reflection does not interfere, practically, with the definition. Many other arrangements, including the use of ellipsoidal and paraboloidal reflectors and cylindrical lenses, are explained and illustrated in Mr. Humphreys's article.

INTENSITY OF THE SUN'S LIGHT.—M. Ch. Fabry has communicated to the Paris Academy of Sciences an interesting paper on the candle-power of the sun's light at sea-level. By an ingenious arrangement, wherein the total solar light is diminished in a known ratio by passage through a slit and then through an ammoniacal solution of copper sulphate, he compared the light with a constant standard light of known candle-power, and, after various corrections, found that at sea-level, with the sun at the zenith, the solar light would be 100,000 times more intense than that produced by a decimal candle at a distance of 1 metre. Supposing that the intensity of the light emitted by different parts of the apparent solar surface is the same, this result shows that the intensity of the light received—after atmospheric absorption—from 1 square mm. of the solar disc is equivalent to 1800 candle-power, as compared with 150–200 candle-power per square mm. emitted by the positive pole of the electric arc.

Taking the amount of heat received per minute from 1 square cm. of the solar surface as 1·5 calories, M. Fabry calculates that the energy consumed per candle-power is about 0·12 watt, but, as the invisible heat rays suffer more by atmospheric absorption, the actual amount of energy used up is probably between 0·15 and 0·2 watt per candle (*Comptes rendus*, No. 23, vol. cxxxvii.).

PRIZES PROPOSED BY THE PARIS ACADEMY OF SCIENCES FOR 1904.

THE following subjects for prizes are proposed for the year 1904 by the Paris Academy of Sciences :—

In geometry, the grand prize for mathematical science (3000 francs), the subject proposed being to perfect, in some important point, the study of the convergence of continued algebraical fractions; the Bordin prize (3000 francs), to develop and perfect the theory of surfaces applicable to the paraboloid of revolution; the Vaillant prize (4000 francs), to develop and study all displacements of an invariable figure in which different points of the figure describe spherical curves; the Francœur prize (1000 francs) and the Poncelet prize (2000 francs), for discoveries useful to the progress of pure and applied mathematics.

In mechanics, the extraordinary prize of 6000 francs, to recompense progress in the direction of increasing the efficiency of the French naval forces; a Montyon prize (700 francs), for the improvement or invention of instruments useful to the progress of agriculture, or the mechanical arts or sciences; and the Plumey prize (2500 francs), for an improvement or invention relating to steam navigation

In astronomy, the Lalande prize (540 francs), for the most interesting observation or memoir dealing with astronomy; the Valz prize (460 francs), for the most interesting observation made during the current year; and the Janssen prize, a gold medal, for an important work on physical astronomy.

In geography and navigation, the Binoux prize (2000 francs), for a work dealing with either of these subjects.

In physics, the Hébert prize (1000 francs), for the best treatise or discovery useful in the practical application of electricity; the Hughes prize (2500 francs), for work contributing to the progress of physics; and the Kastner-Boursault prize (2000 francs), for the application of electricity to the arts, industry, or commerce.

In statistics, a Montyon prize (500 francs), for the best study in French statistics.

In chemistry, the Jecker prize (10,000 francs), for work in organic chemistry.

In physical geography, the Gay prize (1500 francs), for a study of the existing variations in the relative levels of land and sea, by means of precise observations, pursued over a fixed portion of the coasts of Europe or North America.

In botany, the Desmazières prize (1600 francs), for a work on the cryptogams; the Montagne prize (1500 francs), for work on the anatomy, physiology, development or description of the lower cryptogams; the de la Fons-Mélicocq prize (900 francs), for the best botanical work dealing with the north of France; and the Thore prize (200 francs), for the best work on the cellular cryptogams of Europe.

In anatomy and zoology, the Savigny prize (1300 francs), for the assistance of young zoologists making a special study of the invertebrates of Egypt and Syria; and the Thore prize (200 francs), for a work on the anatomy of a European species of insect.

In medicine and surgery, a Montyon prize (three prizes of 2500 francs, three mentions of 1500 francs), for discoveries useful in the art of healing; the Barbier prize (2000 francs), for a valuable discovery in the surgical, medical or pharma-