the atomic weight (X) of each of the first fourteen elements in Mendelejeff's classification is a simple multiple of the same power of the atomic weight of lithium. Or $X^x = m7^x$

$$l.\,X = 1{\cdot}9459 + \frac{l.\,m.}{x}$$

It is easy to see that since x may be any whole number, and m any small whole number, X may have any value whatever within the limits of errors of experiment; or the relation is fanciful rather than real.

8. Values of the definite integral $\frac{2}{\sqrt{\pi}}\int_0^x e^{-x^2}dx$ representing the probability curve, upon which the whole science of the adjustment and comparison of quantitative experiments is based.

Tables of the third class, which offer special facilities to those engaged in any one kind of work, are very numerous.

The physicist has Rankine's "Rules and Tables," Everett's "Units and Physical Constants," Hospitallier's "Formulaire de l'Electricien," and many others.

The chemist has Biedermann's "Kemiker Kalendar," the "Agenda du Chemiste," and various tables for analysis, such as those at the end of Fresenius.

The needs of both physicists and chemists are more or less supplied by Landolt and Bornstein's "Tabellen," the "Annuaire du Bureau des Longitudes," and my own more portable "Numerical Tables and Constants in Elementary Science."

I know of no such numerical compendium dealing with biology, but have often felt the want of one.

To sum up briefly the points which have been so far touched upon. The great majority of numerical problems which really occur in scientific work only require four figures to be accurately dealt with; hence a little ingenuity will generally bring them within the range of small tables. They should be worked out neatly, and as briefly as is consistent with the requisite accuracy; all useless figures should be rigorously excluded as misleading. Some few problems require the use of more powerful tables. Six-figure tables, such as those in Weale's series, and Collins's Logarithms for practical men, are little used, and inconvenient in practice. Seven-figure tables, such as Callet, Hutton, Babbage, Chambers, Schrön, Bremiker, Bruhns, Sang, so far as numbers go are nearly equally good; they differ chiefly in the trigonometrical ratios, which lie outside our present subject, and also considerably in price. SYDNEY LUPTON.

(*To be continued.*)

SOCIETIES AND ACADEMIES.

LONDON.

Zoological Society, December 20, 1887.—Prof. W. H. Flower, F.R.S., President, in the chair.—The Secretary read a report on the additions that had been made to the Society's Menagerie during the month of November 1887.—Mr. Sclater read a letter from Dr. H. Burmeister containing a description of a supposed new Humming-bird from Tucuman. Mr. Sclater proposed to call this species, of which the type was in the National Museum of Buenos Ayres, *Chætocercus burmeisteri*.—The Secretary exhibited, on behalf of Major Yerbury, a pair of horns of the Oorial (*Ovis cycloceros*), which formerly belonged to the Royal Artillery Mess at Fort Attock, and were stated to have been originally obtained in the Chitta Pahar Range, a few miles south of Attock. These horns were apparently of the form lately described by Mr. A. O. Hume as *Ovis blanfordi*.—An extract was read from a letter received from Mr. H. M. Phipson, of the Bombay Natural History Society, offering some living Snakes for the Society's collection.—Mr. F. E. Beddard read a paper on Hooker's Sea-lion, *Otaria* (*Arctocephalus*) *hookeri*, based upon the specimens of this species recently received by the Society, one of which had lately died. The author called attention to the external features, visceral anatomy, and osteology of this Sea-lion, in comparison with the corresponding characters of other species of the group.—Mr. G. A. Boulenger read the description of a new genus of Lizards of the family Teiidæ, founded on a specimen presented to the British Museum by Mr. H. N. Ridley, who had obtained it in the forest of Iguarasse, Pernambuco. The author proposed to name this Lizard *Stenolepis ridleyi*.—A communication from the Rev. H. S. Gorham, entitled a "Revision of the Japanese species of *Endomychidæ*," was read. In this paper three new genera and thirteen new species were characterized and described. Additional observations were made upon the species previously known to inhabit Japan. The new species were based on specimens obtained by Mr. George Lewis during his last journey to the islands in 1880–81.—Mr. G. A. Boulenger gave an account of the fishes obtained by Surgeon-Major A. S. G. Jayakar at Muscat, east coast of Arabia, which had been presented by him to the British Museum. The collection contained specimens of 172 species, many of which were unrepresented in the national collection, and fifteen of which were apparently new to science.—Mr. H. Druce read a paper containing descriptions of some new species of Lepidoptera Heterocera, from Tropical Africa.

EDINBURGH.

Royal Society, December 19, 1887.—Sir Douglas Maclagan, Vice-President, in the chair.—Mr. John Murray communicated a paper on the height and volume of the dry land, and the depth and volume of the ocean. The mean height of the land above sea-level is 2250 feet. Only 2 per cent. of the ocean is included inside a depth of 500 fathoms. Seventy-seven per cent. lies between depths of 500 and 3000 fathoms. The mean depth of the ocean is 12,480 feet. If all the land were utilized to fill up hollows on the earth's surface, the sea would cover it to a uniform depth of 2 miles.—Sir W. Turner read a paper on the pineal gland in the walrus. The gland is excessively developed backwards, being visible from above without any dissection of the brain. The author contrasted it with the same gland in the lizard which is prolonged forwards and ends in the pineal eye. The cerebral lobes in the lizard are small, while those of all mammals are large. He suggested that the development of the lobes may have carried the gland backwards, and caused atrophy of the prolongation ending in the pineal eye. The atrophy, on the other hand, might have been caused by ossification extending over the aperture where the eye is situated.—Dr. Byron Bramwell described a method which he and Dr. Milne Murray had used successfully to record the exact time-relations of cardiac sounds and murmurs.—Prof. Crum Brown submitted a paper by Prof. Letts on the benzyl phosphines.—Dr. H. R. Mill read a criticism by Dr. Guppy on the theory of subsidence as explaining the origin of coral reefs.—Prof. Tait discussed the compressibility of water and of different solutions of common salt. Perkins proved sixty years ago that water becomes less compressible as the pressure is raised. At high pressures then it may be roughly assimilated to an extremely compressed gas. If the gas be regarded as consisting of hard spheres, the curve representing the relation between pressure and volume is approximately hyperbolic. The first asymptote of the hyperbola indicates what must be added to the external pressure to give the whole pressure to which the liquid is subject. The second indicates the ultimate volume to which it could be reduced by an infinite pressure. Applying this to the experimental results given to the Society in July last, the author showed that the pressure in water under ordinary circumstances is somewhere about thirty-two tons' weight per square inch; and the ultimate loss of volume under infinite pressure is about 25 per cent.

PARIS.

Academy of Sciences, December 26, 1887.—M. Janssen, President, in the chair.—Annual address, by M. Janssen. After brief reference to the losses sustained by the Academy during the year by the deaths of the illustrious *savants* MM. Paul Bert, Gosselin, Boussingault, and Vulpian, the President passed on to speak of recent scientific progress in France. Special mention was made of the magnificent Observatory just completed at Nice, for which the munificent founder, M. Bischoffsheim, receives the Arago Medal, now for the first time awarded. Allusion was also made to the isolation of fluorine effected by M. Moissan, and to the development of stellar photography, declared to be an "invention d'origine toute française." Nevertheless reference is made to the preliminary work of the English and American labourers in this field, Rutherfurd, Warren de la Rue, Bond, and Gould.—The Presidential allocution was followed by the announcement of the prizes for the year 1887, by the Secretary, M. J. Bertrand, who also read a paper on the life and work of the distinguished engineer, Stanislas Charles H. Laurent Dupuy de Lome.

Subjoined are the names of the successful competitors for the annual prizes. *Geometry:* Prix Francœur, M. Émile Barbier; Prix Poncelet, M. Appell. *Mechanics:* Extraordinary Prize of 6000 francs, divided between MM. Héraud, Dubois, Rouvier, and Moisson; Prix Montyon, M. Paul Vieille; Prix Plumey, M. Guyou. *Astronomy:* Prix Lalande, M. Dunér; Prix Valz, M. Perigaud; Prix Janssen, the late M. Kirchhoff. *Physics:* Grand Prize for the Mathematical Sciences, M. Willotte; Prix La Caze, MM. Paul and Prosper Henry. *Statistics:* Prix Montyon, MM. Victor Turquan, de Saint-Julien, and G. Bienaymé. *Chemistry:* Prix Jecker, MM. Arnaud and A. Haller; Prix La Caze, M. Moissan. *Geology:* Prix Delesse, M. Gorceix. *Botany:* Prix Barbier, MM. Edouard Heckel and M. Schlagdenhauffen; Prix Desmazières, MM. Ardissone and Dangeard; Prix Montagne, M. Boudier. *Anatomy and Zoology:* Grand Prize for the Physical Sciences, M. Raphael Dubois. *Medicine and Surgery:* Prix Montyon, Drs. Henri Leloir and E. Motais, and MM. Nocard and Mollereau; Prix Bréant, MM. Galtier, Chantemesse, and Widal; Prix Godard, M. Azarie Brodeur; Prix Chaussier, Dr. Jaccoud; Prix Serres, M. Alexandre Kowalevsky; Prix Lallemand, MM. Pitres, Vaillard, and Van Lair. *Physiology:* Prix Montyon, M. Ch. E. Quinquaud; Prix L. La Caze, Dr. Ch. Rouget. *Physical Geography:* Prix Gay, MM. Alfred Angot and Wilhelm Zeuker. *General Prizes:* the Arago Medal, M. Raphael Louis Bischoffsheim; Prix Montyon (Unhealthy Industries), Dr. Edouard Heckel; Prix Trémont, M. Jules Morin; Prix Gegner, M. Valson; Prix Petit d'Ormoy (Mathematical Sciences), the late M. Laguerre; Prix Petit d'Ormoy (Natural Sciences), M. Balbiani; Prix Laplace, M. Jules E. R. de Billy.—Honourable mention was made of the two English physiologists, Drs. Augustus D. Waller and E. Waymouth-Reid, for their memoir on the excised heart of mammals, published in the *Comptes rendus* for May 31, 1887. This study contains a number of new and highly interesting facts regarding the electric phenomena of the heart, the duration of the regular action of its four parts after excision, and the slowness acquired under certain circumstances by the wave of cardiac contraction.—Amongst the more important prizes offered for competition under the usual conditions during the years 1888 and 1889 are the following:—*Geometry:* Grand Prize for the Mathematical Sciences, to complete the theory of algebraic functions of two independent variables; Prix Bordin, to complete in some important particular the theory of the movement of a solid body. *Mechanics:* Prix Fourneyron, theoretic and practical essay on the progress of aërial navigation since 1880. *Astronomy:* Prix Damoiseau, to complete the theory of the irregularities occurring at long intervals in the motion of the moon caused by the planets. *Physics:* Grand Prize for the Mathematical Sciences, to complete in some important particular the theory of the application of electricity to the transmission of labour. *Agriculture:* Prix Vaillant for the best work on the diseases of cereals. *Anatomy and Zoology:* Grand Prize for the Physical Sciences, a complete study of the embryology and evolution of any animal, at the option of the candidate; Prix Bordin, comparative study of the auditory apparatus in warm-blooded Vertebrates, mammals and birds. *Physical Geography:* Prix Gay, to prepare monthly charts of the surface currents in the Atlantic, with a survey of the movement of drift ice in the waters about the Arctic regions; Prix Gay, to determine by a comparative study of their respective faunas and floras the relations formerly existing between the Polynesian Islands and the neighbouring lands.

Astronomical Society, November 9, 1887.—M. Flammarion, President, in the chair.—The President read a paper on some observations on the relative colours of stars, which he had made in 1875 by means of a specially constructed sextant in which the images of two stars wide apart could be brought into the same field.—M. Detaille read a paper on the photography of the solar spectrum with a direct-vision spectroscope, and stated that this subject was quite within the reach of amateurs, on a small scale of course, and presented many interesting points. He showed some negatives and positives obtained with a small instrument.

December 14.—M. Flammarion, President, in the chair.—The meeting was opened by the distribution of the calendar reform prizes, amounting, in medals and money, to the value of 5000 francs (an anonymous gift):—1st prize, 1500 francs, M. Gaston Armelin, of Paris; 2nd prize, 1200 francs, M. Hanin, of Auxerre; 3rd prize, 1000 francs, M. Francis de Roucy, of Compiègne; 4th prize, 800 francs, M. Barnout, of Paris; 5th prize, 250 francs, M. Remy Thouvenin, of Nancy; 6th prize, 250 francs, M. Blot, of Clermont (Oise).—M. Flammarion read a paper on some probable common proper movements of certain stars. In looking over the catalogue of the Paris Observatory, he had observed that several stars in Taurus—namely, Lalande 8178, 8209, 8237, 8256, 8297, 8404—had no motion in declination, and had all about the same proper motion in R.A. The same remarks apply to θ^1 and θ^2 Tauri. The two stars γ Leporis and Lalande 10931 seem also to be connected.—Colonel Laussedat, Director of the Conservatoire des Arts et Métiers, exhibited a curious binocular glass, constructed for Louis XIV. by Father Seraphin in 1681. This huge instrument comprises three rectangular bows which slide into each other. The length of the whole affair is no less than 3 metres 10 centimetres.—M. Neuville, in a letter, notices that the minimum of Algol seems longer than 6 minutes as given by several authors. He adopts 18 minutes, and gives a probable size of Algol's dark companion.—MM. Paul Henry and Detaille remark that Webb gives 18 minutes as the duration of Algol's minimum.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

Birds of Wiltshire: Rev. A. C. Smith (Porter).—Arithmetic Papers: S. J. D. Shaw (Deighton, Bell, and Co.).—Major Lawrence, F.L.S., 3 vols.: Hon. E. Lawless (Murray).—Catalogue of the Fossil Mammalia in the British Museum; Natural History, Part v.: R. Lydekker (London).—Prodromus of the Zoology of Victoria, Decades 1-14: F. McCoy (Melbourne).—The Theory and Use of a Physical Balance: J. Walker (Clarendon Press).—Journal of Anatomy and Physiology, January (Williams and Norgate).

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