

mines, especially where the data are known to be very accurate. Doubling the weights above assigned to Przibram, St. Gothard, Mont Cenis, Schemnitz, Kentish Town, Rosebridge, and Seraing, and quadrupling that assigned to Spereberg, no material difference is made in the result. The mean still comes out 1° F. in 64 feet, or more exactly '01566 of a degree per foot.

This is a slower rate than has been generally assumed, but it has been fairly deduced from the evidence contained in the Committee's Reports; and there is no reason to throw doubt on the results in the upper portion of the above list more than on those in its lower portion. Any error that can reasonably be attributed to the data used in the calculations for the St. Gothard Tunnel and for the numerous deep mines of the East Manchester coalfield, will have only a trifling effect on the rates of increase assigned to these localities.

To obtain an approximation to the rate at which heat escapes annually from the earth, we will first reduce the above rate of increase '01566 to Centigrade degrees per centimetre of depth. For this purpose we must multiply by '0182, giving '00285.

To calculate the rate of escape of heat, this must be multiplied by the conductivity.

The most certain determinations yet made of the conductivity of a portion of the earth's substance are those deduced by Sir William Thomson by an indirect method, involving observations of underground thermometers at three stations at Edinburgh, combined with laboratory measurement of the specific heats and densities of the rocks in which the thermometers were planted. The specific heats were determined by Regnault, and the densities by Forbes. Specific heats and densities can be determined with great accuracy in the laboratory, but the direct determination of conductivity in the laboratory is exceedingly difficult, it being almost impossible to avoid sources of error which make the conductivity appear less than it really is.

Prof. Herschel, in conjunction with a Committee of the British Association, has made a very extensive and valuable series of direct measurements of the conductivities of a great variety of rocks, and has given additional certainty to his results by selecting as two of the subjects of his experiments the Calton Hill Trap and Craigleith sandstone, to which Sir William Thomson's determinations apply.

From combining Prof. Herschel's determinations with those of Sir Wm. Thomson, '0058 is adopted as the mean conductivity of the outer crust of the earth, which, being multiplied by the mean rate of increase, '00285, gives

$$16330 \times 10^{-10}$$

as the flow of heat in a second across a square centimetre. Multiplying by the number of seconds in a year, which is approximately 31½ millions, we have

$$1633 \times 315 \times 10^4 = 41'4.$$

This, then, is our estimate of the average number of gramme-degrees of heat that escape annually through each square centimetre of a horizontal section of the earth's substance.

### UNIVERSITY AND EDUCATIONAL INTELLIGENCE

CAMBRIDGE.—The lists of Boards of Studies for the first time include the separate Boards of Physics and Chemistry, and of Biology and Geology, as constituted by the new Statutes. The Woodwardian Professor appears in both Boards. The Physiology Professor, not being yet appointed, only appears in brackets; the same is the case with the Professor of Pathology in the Board of Medical Studies.

The new Statute B having been finally approved, determines that in 1883 and 1884, a sum of between 5000*l.* and 6000*l.* in each year will become available for University purposes from College revenues, subject only to deduction of 40*l.* by each College for each Professorial Fellowship held at the College.

The Professors of Physiology, Pathology, and Mental Philosophy and Logic are to be appointed in such order as the University may think fit, as soon as sufficient funds can be provided conveniently for the purpose from the common University fund, or from other sources. The Professors of Physiology and of Pathology are not to undertake the private practice of medicine or surgery. The stipends are fixed at 800*l.* for these two Professors, and 700*l.* for the Professor of Mental Philosophy.

The appointment of Readers is similarly dependent on the convenient provision of funds. Thus, until the Council of the

Senate has published its recommendations, nothing certain can be said as to the objects upon which it will be thought wisest first to expend the new funds accruing. But it must not be forgotten that a considerable amount of the new income will be required to pay the increased stipends of present professors.

Prof. Liveing will lecture on the General Principles of Chemistry this term, and also take practical classes in spectroscopic analysis. Prof. Dewar will lecture on Physical Chemistry, and Tutorial lectures will be given in connection with this course by Mr. A. Scott, Prof. Dewar's assistant. Demonstrations in volumetric chemistry will be given by one of the demonstrators.

Lord Rayleigh will lecture on Electrical Measurements to advanced students; Mr. Glazebrook will give demonstrations on Electricity and Magnetism, and Mr. Shaw on Heat in the Cavendish Laboratory. Mr. Trotter will give an elementary course on Electricity and Magnetism at Trinity College, and also a course on Optics and Light.

Mr. Vines will lecture on the Physiology of Plants, at Christ's College, in connection with practical work, and will also give an elementary course at the New Museums, especially for medical students. The Assistant Curator of the Herbarium, Mr. T. H. Corry, B.A., of Caius College, will give a series of demonstrations on the natural orders of plants.

Prof. Stuart will lecture on Mechanism and Applied Mechanics, and the workshops and drawing office will be opened to pupils on October 13. At Gonville and Caius College one or more Entrance Scholarships of values varying from 40*l.* to 80*l.* according to merit of candidates, will be awarded in Natural Science by an examination beginning on January 8 next. They are only open to candidates under nineteen years of age on the first day of examination, and are tenable only for one year, after which a foundation scholarship may be awarded. The subjects are Physics, Chemistry, Biology, and Animal Physiology; two subjects at least are required, Chemistry being essential. Particulars of subjects may be learnt on application to the Senior Tutor, Rev. A. W. Steel. Scholarships may also be awarded for Mathematics and Natural Science combined.

The examination for Entrance Scholarships at Emmanuel College will commence on January 12. They are tenable in the first instance for two years. The subjects in Natural Science are Chemistry, Physics (including Dynamics and Hydrostatics), Elementary Biology, and Geology and Mineralogy. Candidates may also obtain scholarships for Mathematics and Natural Science combined. Mr. W. Chawner, the tutor, will supply all information.

Mr. A. Sedgwick, of Trinity College, Cambridge, will conduct the classes in Morphology which Prof. Balfour had announced for the present term.

### SCIENTIFIC SERIALS

*The Journal of Anatomy and Physiology (Normal and Pathological)*, vol. xvi. pt. iv., July, 1882, contains:—Observations in comparative myology, by Dr. Hans Gadow. The first section of this interesting paper is devoted to the important subject of a scientific nomenclature for muscles.—On fat embolism, by Drs. R. Saundby and G. Barling (with a plate).—On Micrococcus poisoning, by Dr. Alex. Ogston.—On the action of saline cathartics, by Dr. M. Hay (D and E series of experiments).—On a variety of pulmonary lobation and its relation to the thoracic parietes, as illustrated by comparative anatomy and abnormalities in the human subject, by Dr. W. Allen.—Prof. Gegenbaur, critical remarks on polydactyly as atavism; translated by Drs. Garson and Gadow.

*The American Naturalist* for August, 1882, contains—On the compass plant, by B. Alvord.—On the development of the tree-toad, by M. H. Hinkley.—On some entomostraca of Lake Michigan and adjacent waters, by S. A. Forbes.—Organic physics, by Charles Morris.—The Editor's table.—Recent literature.

The same for September, 1882, contains—The methods of microscopical research adopted in the Zoological Station in Naples, by C. O. Whitman.—Notes on the habits of the "Savannah cricket frog," by C. C. Abbott.—On the evolution of forms from the Clinton to the Niagara group, by E. N. S. Ringueberg.—On hypnotism in animals, by Dr. W. Prentiss.

*The Transactions and Proceedings of the New Zealand Institute* for 1882, being vol. xiv., edited by Dr. J. Hector, F.R.S., and published at Wellington, May, 1882, have just reached us. They form a royal octavo volume of over 600 pages and 39 plates.