

groups were formed is still an unsolved enigma. Ischia, as has been long known, shows by the fossiliferous deposits clothing its flanks, to have undergone great elevation since its original formation, and as we have no such evidence in the other volcanoes, we must conclude for the greater antiquity of Ischia. I also believe that the volcanic group of Roccamonfina is very much older than that of the Phlegrean Fields and Vesuvius, because we find the *piperno* and the *pipernoid tuff*, very old volcanic deposits in these regions, forming a mantle over Roccamonfina when it was almost a complete mountain. It must not be forgotten, however, that in the "Museum Breccia," first described by me, we have evidence of the effusion in these regions of many varieties of rocks long anterior to the *piperno*.

Gradually the large quantity of lava and fragmentary materials that were ejected at the bottom of the gulf, greatly diminished its depth, and this, combined with general elevation, resulted in the emergence of a number of volcanic islands at Roccamonfina, Ischia, Naples; and probably Vesuvius was, at first, like the others an island. Constant general elevation soon drove back the sea, leaving high and dry all that region we so well know. This plain, with its volcanic hills and mountains, constitutes one of the most beautiful, the most fertile, and the healthiest regions of our earth, if man were more capable of appreciating, enjoying, and developing this *pezzo di cielo caduto in terra*.

So many are the advantages that Vesuvius offers to the student of vulcanology, that I think it advisable to pass them in review. This renowned volcano occupies a very central position in the civilised part of the globe, only a few kilometres from Naples with all the resources of a great city, and in communication by numerous lines of passenger vessels and railways with all parts of Europe and America. Means of visiting Vesuvius are numerous, whilst the volcano is now entirely surrounded by a network of railways, besides good roads. By road and railway the top of the mountain can be reached, and upon its flanks can be found hotels and accommodation of all kinds, besides a meteorological observatory, intended to be used for the daily study and record of its varying phases. The simple but interesting form of the mountain, the extraordinary and unrivalled variety of its productions, which surpass in number, beauty, and interest those of any other volcano yet studied, are also a matter of maximum importance to the student. Besides this, of equal importance we must reckon that continuous activity with variation within such limits as to permit detailed study on the spot, and still more fully in the University laboratories or elsewhere.

Scattered over Italy, and within a few hours' reach, are several other active volcanoes, each having its own special interest, besides a large number of extinct ones and subsidiary volcanic phenomena, all of which, beyond their scientific interest, have a very great importance to the inhabitants from an agricultural, industrial, and hygienic point of view. This is especially the case in the immediate vicinity of the active ones, so that it becomes the duty of the Government to maintain a system of observation and record, and to develop a school in which students may acquire a scientific knowledge of vulcanology.

At Naples we have a chair of terrestrial physics, but as under this name is included a vast amount of different groups of phenomena, it is impossible for its holder to give a fair share of vulcanology alone. So far, the only chair of vulcanology was that of Catania, which was so well occupied by the late Prof. O. Silvestri, and which, after his premature death, was abolished.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—The following have been appointed Public Examiners in the Honour School of Natural Science:—Mr. James Walker, of Christ Church, in Physics, Dr. Henry F. Morley, in Chemistry, and Dr. George A. Buckmaster, of Magdalen College, in Physiology.

The list of the newly elected Fellows of the Royal Society includes three Oxford men—the Rev. F. J. Smith, Mr. V. H. Veley, and Prof. Viriamu Jones.

A conversazione will be given in the University Museum on Tuesday next, by the members of the Junior Scientific Club.

CAMBRIDGE.—The Board of Managers of the Arnold Gerstenberg Studentship give notice that a Studentship on this Founda-

NO. 1281, VOL. 50]

tion will be offered for competition in the Easter Term of 1895. Candidates will have the option of being examined either in Logic and Methodology, or in Psychology. The Examination will be held at the time of the Moral Sciences Tripos: that is, not earlier than the last Monday but one in May 1895. The exact date of the examination will be announced later. The schedule of the subjects of examination will be the same as the schedules in Psychology and in Logic and Methodology for Part I. of the Moral Sciences Tripos. The competition will be open to men and women who have obtained honours in Part I. or Part II. of the *Natural Sciences Tripos*, and whose first term of residence was not earlier than the Easter Term of 1889. Candidates must send in their names not later than April 19, 1895, to Dr. Sidgwick, Newnham College, Cambridge, and must declare their intention, if successful, of pursuing a course of philosophical study. The studentship, which will be of the annual value of nearly £90, will be tenable for two years, upon the condition that at the end of the first year the student's progress in philosophical study is deemed satisfactory by the Board of Managers.

Dr. W. S. Melsome, Fellow of Queen's College, and Mr. Hubert Higgins, of King's College, have been appointed Senior and Second Junior Demonstrators of Anatomy respectively.

There are vacancies at the University's tables in the Naples Zoological Station, and at the Plymouth Marine Biological Laboratory. Applications to occupy these are to be sent to Prof. Newton, Magdalen College, by May 24th.

Prof. Macalister announces a short course of lectures in Physical Anthropology for May 16th, 19th, and 21st. The subjects are "Methods of Anthropometry," "The Races of Ancient Egypt" (at this lecture a mummy will be unwrapped and examined), and "The Races of Western Europe."

The Council of the Senate have published a Report recommending that in future all appointments of Demonstrators, and of Assistants to Professors, shall be made for a specific period not exceeding five years. At the end of this period the Demonstrator or Assistant is to be eligible for reappointment. It is also proposed that in the case of the vacancy of a Professorship, the Demonstrators and Assistant are to cease to hold office within three months of the appointment of a new Professor.

THE Master, Wardens, and Commonalty of the Society of Merchant Venturers of the City of Bristol have decided that their Technical School shall henceforth be known as the Merchant Venturers' Technical College. In this connection the following nominations have been made:—Principal and Professor of Chemistry, Mr. J. Wentheimer; Professor of Mechanical Engineering, Mr. J. Munro; Professor of Electrical Engineering and Applied Physics, Mr. W. Wilson.

SCIENTIFIC SERIALS.

The Mathematical Gazette, No. 1, April 1893, 8 pp. (London: Macmillan.)—It is now matter of ancient history that a correspondence in the columns of NATURE resulted in the formation, in January 1871, of the Association for the Improvement of Geometrical Teaching. The original objects of the association were threefold: to collect and distribute information as to the prevailing methods of instruction in geometry practised in this and other countries, to use its influence to induce examining bodies to frame their questions in geometry without reference to any particular text-book, and to stamp with its approval some text-book already submitted, or to bring out a new one under its own auspices. Ten years later, viz. in January 1881, the association widened its basis, though after some discussion it retained its name. The objects it had in view were now sought to be carried out by the reading of papers and raising discussions, and by the appointment of committees to report on existing defects in the usual methods, order, range, &c., in teaching special subjects—all branches of elementary mathematics and mathematical physics being included in the widened basis. Now that the association has passed its majority, it is thought that it owes its continued existence to a "widespread desire on the part of teachers of mathematics to become acquainted with the methods of other teachers." The editor of the *Gazette*, Mr. E. M. Langley, to whose long-continued and enthusiastic

advocacy of its aims the Association for the Improvement of Geometrical Teaching owes so much as late secretary, hopes, through the agency of its columns, to extract from experienced teachers MSS. which have long been lurking in desk or pigeon-hole for want of a suitable organ for making them known. This new venture, which has been started in consequence of a resolution passed at the association's annual meeting in January last, is proposed to be "a terminal journal for students and teachers." The editor has to feel his way: words of encouragement have come from the far East and West, as well as from many teachers in this country. The number before us opens with a short paper, by the editor, on the eccentric circle of Boscovich. We borrow from Dr. C. Taylor's classical book on Conics the following verdict on Boscovich's work:—It is "a clear and compact treatise, which for simplicity, depth, and suggestiveness will not readily be surpassed." Dr. J. S. Mackay abstracts the first book of Gino Loria's treatise on "the exact sciences in ancient Greece," viz. that on the Greek geometers before Euclid. In addition to the works cited by Dr. Mackay, we may call attention to three notes on the history of mathematics by the Danish mathematician, H. G. Zeuthen (which have recently been published in the *Bulletin de l'Académie Royale des Sciences de Danemark* (1893). Prof. A. Lodge gives some useful approximations and reductions. Then follow some elegant solutions of examination questions, and a select number of questions for solution. A commendation of the new French journal, *l'Intermédiaire des Mathématiciens* closes this No. 1. The size of the paper, the clear type, and the excellent paper, should secure for the *Gazette* far more than a mere *succès d'estime*. The figures are lithographed on a separate sheet. We note one little slip—Adam's property for Adams' (p. 8.)

American Journal of Mathematics, vol. xvi. 2. (Johns Hopkins University, April, 1894.)—W. H. Metzler in compound determinants (pp. 131–150) shows how to express certain minors of a compound determinant $\Delta_{(m)}$ in terms of the minors of various orders of Δ . The paper is divided into two parts, one relating to determinants, the other to matrices. A short note follows on the order of terms in a semi-convergent series, by H. P. Manning (pp. 151–155). Writing on the addition theorems of Jacobi and Weierstrass (pp. 156–163), E. Study gives a new presentation of results connected with an investigation of the addition theorems given in Hirzel's paper, "Sphärische Trigonometrie, orthogonale Substitutionen und Elliptische Functionen" (1893). Two articles follow by A. Chessin. The first is summation of logarithmic and exponential series (pp. 164–185), the second a note on the general solution of Bessel's equation (pp. 186–7). In an article on adjustable cycloidal and trochoidal curves (pp. 188–204) Prof. F. Morley gives many interesting results in connection with these curves. The text is illustrated with several carefully drawn figures. A two-page note on induced linear substitutions, by Prof. F. Franklin, closes the number.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, April 19.—"Electrical Interference Phenomena somewhat analogous to Newton's Rings, but exhibited by Waves along Wires." By Edwin H. Barton, B.Sc., late "1851 Exhibition" Science Scholar.

(1) The preliminary paper (Roy. Soc. Proc., vol. liv. pp. 85–96, 1893) on this subject gave the results of a single experiment, and approximately accounted for them by a mathematical theory of the phenomena involved.

(2) The present paper discusses the question of disturbances, and gives nine experiments. Two of these are similar to the first experiment, but were made under better conditions; the others were made either to lead to these improved conditions or in confirmation of the original fundamental conclusions.

(3) The disturbances alluded to arise from the fact that the electrical waves are not suddenly lost after their first incidence upon the abnormal part of the secondary, but course to and fro until they die out. A method of avoiding the greatest disturbance due to this cause is pointed out and adopted. A correction is also calculated and applied for another disturbance which still remains.

(4) The chief experiment (Expt. v. arts. 42–48) is on interference phenomena, somewhat analogous to Newton's rings, by transmission.

(5) The experiments conclude with two examples (Expts. viii. and ix. arts. 51–62) of modifications of the secondary which produce no reflexion. These consisted respectively of thinner wires near together, and of thicker wires further apart, than the normal spacing. In each case the capacity was practically unaltered by the change in the wires; hence, as anticipated from the theory, no reflexion occurred.

(6) The systematic comparison of theory and experiment, made (Arts. 63–77) near the end of the paper, does not exhibit an absolute quantitative agreement. Nevertheless, the two are so far concordant in all their general features as to be mutually confirmatory, and were approved by Prof. Hertz (under whose able guidance the work was carried out in Bonn, 1892–93) as close approximations.

"On Rocks and Minerals collected by Mr. W. M. Conway in the Karakoram-Himalayas." By Prof. T. G. Bonney, F.R.S., and Miss C. A. Raisin.

Physical Society, April 27.—Prof. A. W. Rücker, F.R.S., President, in the chair.—A paper on the mechanism of electrical conduction (Part I. Conduction in Metals) was read by C. V. Burton. Considering a body not at absolute zero of temperature, the author shows that electromagnetic radiation would result in heat being degraded into a lower form of energy, if any parts of finite electric conductivity were present, and from the fact that our planet is not devoid of heat, deduces the following Theorem I. :—"In a region containing matter there may be (and probably always are) some parts which are perfect insulators, and some parts which are perfect conductors, but there can be no parts whose conductivity is finite, unless every finitely conductive portion is enclosed by a perfectly conductive envelope." This conclusion is in accordance with Poisson's theory of dielectrics, and with Ampère's and Weber's theories of magnetism and diamagnetism respectively. Theorem II. is enunciated as follows :—"In metals, and in other non-electrolytes whose conductivity is finite, the transmission of currents must be affected by the intermittent contact of perfectly conductive particles"; and as a corollary, Theorem III. is given :—"If we suppose that in a substance at the absolute zero of temperature there is no relative motion amongst the molecules or amongst their appreciable parts, it follows that every substance at this temperature must have either infinite specific resistance (which does not imply infinite dielectric strength) or infinite conductivity." Fleming and Dewar's experiments on pure metals tend to confirm this. The author then shows why, on the intermittent contact hypothesis, a conductor is heated when a current flows through it. On the assumption that in ordinary conductors the relation between the electromotive intensity in the intermolecular spaces and electric displacement is a linear one, and that the electric forces are small in comparison with the ordinary intermolecular forces, Ohm's Law is deduced. A model is next described by means of which contact E.M.F. and the Peltier effect can be represented and explained, and in considering Volta E.M.F.'s, the author points out that it is doubtful whether experiments in a perfect vacuum could decide the questions at issue in the contact-force controversy. The fact that the transparency of metals is much greater than Maxwell's theory indicates might be explained without attributing any new properties to the electromagnetic field by supposing the dimensions of molecules not quite negligible in comparison with the wave-length of light. Prof. S. P. Thompson thought the paper had an important bearing on the kinetic theory of solids. He saw no reason why Ohm's Law should be proved, for he regarded it as a definition. The President said the author represented all actions as being due to collisions, thereby introducing the same difficulties as were felt in the kinetic theory of gases, viz. that collisions would give rise to mechanical oscillations in the molecules of shriller and shriller pitch. Prof. J. J. Thomson had recently given an explanation of electrical phenomena by vortex filaments. After some remarks on the visibility of molecules by Mr. Hovenden, Dr. Burton, in reply to Prof.

Thompson, said Ohm's Law, when expressed as $\frac{E}{C} = a \text{ constant}$, was really a law, and not a mere definition.—A communication on the design and winding alternate-current electromagnets, by Silvanus P. Thompson, F.R.S., and Miles Walker, was read by the former. The paper describes experiments showing that when the magnetic induction does not exceed 4000 (C.G.S.), the pull exerted by a laminated electro-