

than has hitherto been usual of the mathematical questions proposed to be set in the University examinations." The following resolutions were also carried. (1) That a special Committee of thirteen members, including the Chairman of Convocation, be nominated to prepare for presentation to any Statutory Commission which may be appointed a memorandum of points in the scheme of the Royal Commission in which modification is desirable, and with power to confer with such said Statutory Commission, and with the Senate or any Committee thereof. (2) That this special Committee consist of the following members:—The Chairman of Convocation, Dr. Allchin, Dr. Benson, Mr. Bompas, Mr. Stanley Boyd, Dr. Cave, Mr. Cozens-Hardy, Mr. Thiselton-Dyer, Dr. Heber Hart, Dr. Napier, Mr. Blake Odgers, Dr. Sansom, Prof. S. P. Thompson. (3) That the new and enlarged special Committee recommended for appointment in the report of the special Committee on the memorandum to be presented to such said Statutory Commission should have full powers, if it thinks fit, to prepare amendments to the London University Commission Bill and to have them proposed on behalf of Convocation in either House of Parliament.

At a special meeting of the Technical Instruction Committee of the Cheshire County Council the following resolutions were adopted, and instructions given for them to be forwarded to the President and Vice-President of the Council.

(1) "That in the opinion of this Committee the Education Bill of this Session, as printed, will have the effect, by adding new subjects (not technical nor manual) for assistance out of the Customs and Excise grant, of making it impossible for the successors of this Committee, without recourse to a rate in aid, to continue the maintenance grants to those Science and Art Committees which their predecessors have, in good faith, on the assurance of her Majesty's Ministers in the past that the grant or its equivalent would not be withdrawn, fostered, or created. That the financial clauses of the Bill, confirming only a rate of one penny in the pound, in addition to the local taxation (Customs and Excise) grant, are inadequate for the work of secondary and technical education it is proposed the new Education Committee shall undertake."

(2) "That this Committee would respectfully urge upon her Majesty's Government that a County Council may have the option of nominating two school committees, one an elementary school committee, and the other a secondary school committee, with a view to secure for service in each committee members specially qualified for the work of each grade who would not have leisure time to attend to the two combined, and ventures to express a hope that for the purpose of education other than elementary the cost thereof may be wholly borne by the Imperial Exchequer, or, failing that, the Education Committee may have the benefit of at least a rate of 2d. in the pound."

(3) "That, in the opinion of this Committee, Clause II., Sub-section 3, relating to the performance by the education authority of the work of the numerous school attendance committees in the county, is impracticable, and cannot be undertaken by the education authority."

SCIENTIFIC SERIALS.

American Journal of Science, April.—The morphology of *Triarthrus*, by C. E. Beecher. Most of the recent advances in the knowledge of trilobite structure have come from the study of *Triarthrus*. Much time was spent by the author in carefully working out the numerous specimens from the abundant material in the Yale Museum. Altogether upwards of five hundred individuals with appendages more or less complete have been investigated; and at the present time all the important exoskeletal features have been seen and described. The appendages of *Triarthrus* are exceptionally long. It must have been a sort of "Daddy Long-legs" among the Trilobites, as *Scutigera* is among the Myriapoda. The delicacy of the appendages and ventral membrane of trilobites and their rarity of preservation are sufficient demonstration that these portions of the outer integument were of extreme thinness, and therefore perfectly capable of performing the function of respiration. The paper is accompanied by a plate showing a dorsal and a ventral view of a specimen fully restored.—Climatic zones in Jurassic times, by A. E. Ortmann. The author proves that the argument given by

Neumayr for the non-existence or non-action of topographical differences upon the distribution of the Jurassic faunas is a complete failure. Only one point may be granted, that a separation by land was not present in an extensive manner. On the other hand, it is highly probable that on the one side differences of depth of the seas, on the other differences of facies, are the laws governing the faunistic differences. The first cause applies especially to the distinction of the Mediterranean and Middle-European provinces, the second to that of the Middle-European and Russian (Boreal) provinces.—Metamorphism of a gabbro occurring in St. Lawrence County, N.Y., by C. H. Smith, junr. The extreme effect of metamorphism on this gabbro has been to produce complete recrystallisation, yielding a granulitic structure. This metamorphism takes place in three stages. The first is marked by the formation of scapolite and some scaly hornblende, with little or no sign of crushing, the probable agents of change being pressure, heat, and solutions. In the second stage the effects of crushing are pronounced. All of the constituents are granulated, and the rock becomes more or less gneissoid. At the same time the scaly hornblende increases in quantity, seeming to reach its maximum in this phase of the rock. Finally, in the third stage, the rock undergoes complete recrystallisation, the newly-formed constituents being arranged normal to the pressure that has crushed the rock, and thus producing a pronounced gneissoid structure.—An occurrence of free gold in granite, by G. P. Merrill. A piece of quartz described as "gold ore, Sonora, Mexico," was found to be not superficially impregnated with gold, but to contain flecks of free gold throughout its substance. There is no other way of accounting for it other than by considering it a true constituent of the rock, crystallised from the original magma. It is completely embedded in the clear grassy quartz and unfissured felspars. No pyrite or other sulphides could be detected. This is believed to be a unique occurrence.

Wiedemann's Annalen der Physik und Chemie, No. 4.—On the nature of the X-rays, by D. A. Goldhammer. The author believes the X-rays to be not longitudinal light waves, but ultra-violet rays of extreme shortness. The absence of refraction would be quite consistent with this view, since in several theories of dispersion the index of refraction for infinitely short waves is unity. The absence of reflection would be due to the smallness of the waves compared with the unevenness of ordinary polished surfaces. This also explains the absence of polarisation. As regards the variation of absorption with the density simply, this is analogous to the absorption of light by aniline and other solutions, which simply depends upon their concentration. The author gives no reason against these rays consisting of longitudinal vibrations.—On the determination of overtones, by C. Stumpf. Careful investigations show that wherever overtones may influence the result of an experiment, the source of sound must always be specially tested as regards its composition, and that theoretical proofs of the simplicity of a tone are often misleading. Wherever simple tones are to be produced, the sound must be as faint as possible, or the overtones must be excluded by interference.—On the origin of contact electricity, by C. Christiansen. To establish a difference of potential between mercury and either zinc, cadmium, lead, or tin amalgam, the presence of oxygen is essential. Further experiments were made with hydrochloric and sulphurous acids, carbon bisulphide and nitrous oxide. Hydrochloric acids gave a polarisation effect with all the amalgams for which it was found in the case of oxygen, and for copper in addition. SO₂ gave effects with zinc and cadmium. The other gases gave no effect.—Polarisation and resistance of a galvanic cell, by Franz Streintz. The author shows that the determination of galvanic polarisation in an electrolytic cell in a closed circuit is an impossibility, since the "resistance" of the cell is an unknown function of the current strength.—The iron sphere in a homogeneous magnetic field, by O. Grottrian. By induction experiments made with coils of wire laid over an iron sphere so as to cut off segments of various sizes the author shows that the sphere is evenly magnetised throughout its substance, as predicted by theory. The result is not affected by the direction of "grain" of wrought iron.—Diminution of the intensity of sound with the distance, by K. L. Schaefer. Sound does not diminish in intensity strictly with the square of the distance, but at first more slowly, and then more rapidly. This was proved by means of a telephone attached to a clock and brought to different degrees of sensitiveness.

Memoirs (Zapiski) of the Caucasian Branch of the Russian Geographical Society, vol. xviii., Tiflis, 1896.—Review of the atmospheric sediments fallen in Caucasia during the spring and summer of 1894, by A. Woznesensky, with four maps.—A journey to the mountain region of the district Tchernomorsk, by N. Albof, with a map of the district, 6·7 miles to the inch. The author has visited, for botanical purposes, some of the least-known valleys of the region, and now gives the diary of his journey.—Studies in the geographical botany of Western Transcaucasia, by the same author. The article is full of valuable data. Several interesting finds are mentioned, such as the new species *Amphoricapus elegans*, and a *Campanula*, which so much exceeds all known species of the same genus by its beauty, that M. Albof proposes for it the name of *Campanula regina*, and remarks that its general shape so much differs from all other now living *Campanula* species that it must be, without doubt, a remainder from a foregone geological flora.—On the Kumyks, an anthropological sketch, by J. Pantukhof.—The Pshaves and their land, by M. Khizanachwili.—A journey to the central part of the land of the Chechenes, by Mme. A. Rossikof, with a map, three miles to the inch, of this very little part of the main ridge.—A statistical description of the governments of Baku and Kars, from the "Caucasian Calendar."—The state of the glaciers on the northern slope of the Caucasus, by K. Rossikof, being the results of the measurements of the motion of several glaciers in 1893 and 1894; and on the present state of the desiccating lakes of the northern slopes of the Caucasus, by the same author. The same volume contains, as a supplement, a most welcome atlas of ethnographical maps of Transcaucasia, drawn by the Secretary of the Society, E. Kondratenko. The maps are the result of many years' work. The classification of the more than sixty different stems which inhabit Transcaucasia is the result of the remarkable works of Baron Uslar and his follower, M. Zagursky; and the numerical data as to the numbers of inhabitants belonging to each stem are obtained from a census made in the years 1886–1891. The maps, on the scale of thirteen miles to the inch, are seven in number, and represent the governments of Tiflis, Kutais, Baku, Elizabethpol, Daghestan, Erivan, and Kars. The limits of each village community are indicated, and the nationality which prevails in each village is shown in different colours; while, on the borders of each map, special coloured diagrams give the ethnographical composition and the numbers of each nationality for each town and district, as well as for the whole government, so that one sees at a glance their numerical proportions. Full tables of figures are given by M. E. Kondratenko in the text of the *Zapiski*. The value of this work is enhanced by an ethnographical map of Turkish Armenia and Kurdistan, published in the same volume. It is based upon V. Cuinet's statistics, given in his work, "La Turquie d'Asie," and shows in different colours the percentage of Turks and Armenians in each *kaza*, or sub-district.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, April 30.—"The Total Eclipse of the Sun, April 16, 1893. Report and Discussion of the Observations relating to Solar Physics." By J. Norman Lockyer, C.B., F.R.S.

The memoir first gives reports by Mr. Fowler and Mr. Shackleton as to the circumstances under which photographs of the spectra of the eclipsed sun were taken with prismatic cameras in West Africa and Brazil respectively on April 16, 1893. These are followed by a detailed description of the phenomena recorded, and a discussion of the method employed in dealing with the photographs. The coronal spectrum and the question of its possible variation, and the wave-lengths of the lines recorded in the spectra of the chromosphere and prominences, are next studied.

Finally, the loci of absorption in the sun's atmosphere are considered.

The inquiry into the chemical origins of the chromospheric and prominence lines is reserved for a subsequent memoir.

The general conclusions which have been arrived at are as follows:—

(1) With the prismatic camera, photographs may be obtained with short exposures, so that the phenomena can be recorded at short intervals during the eclipse.

(2) The most intense images of the prominences are produced by the H and K radiations of calcium. Those depicted by the rays of hydrogen and helium are less intense, and do not reach to so great a height.

(3) The forms of the prominences photographed in monochromatic light (H and K), during the eclipse of 1893, do not differ sensibly from those photographed at the same time with the coronagraph.

(4) The undoubted spectrum of the corona in 1893 consisted of eight rings, including that due to 1474 K. The evidence that these belong to the corona is absolutely conclusive. It is probable that they are only represented by feeble lines in the Fraunhofer spectrum, if present at all.

(5) All the coronal rings recorded were most intense in the brightest coronal regions, near the sun's equator, as depicted by the coronagraph.

(6) The strongest coronal line, 1474 K, is not represented in the spectrum of the chromosphere and prominences, while H and K do not appear in the spectrum of the corona, although they are the most intense radiations in the prominences.

(7) A comparison of the results with those obtained in previous eclipses confirms the idea that 1474 K is brighter at the maximum than at the minimum sun-spot period.

(8) Hydrogen rings were not photographed in the coronal spectrum of 1893.

(9) D_3 was absent from the coronal spectrum of 1893, and reasons are given which suggest that its recorded appearance in 1882 was simply a photographic effect due to the unequal sensitiveness of the isochromatic plate employed.

(10) There is distinct evidence of periodic changes of the continuous spectrum of the corona.

(11) Many lines hitherto unrecorded in the chromosphere and prominences were photographed by the prismatic cameras.

(12) The preliminary investigation of the chemical origins of the chromosphere and prominence lines enables us to state generally that the chief lines are due to calcium, hydrogen, helium, strontium, iron, magnesium, manganese, barium, chromium, and aluminium. None of the lines appear to be due to nickel, cobalt, cadmium, tin, zinc, silicon, or carbon.

(13) The spectra of the chromosphere and prominences become more complex as the photosphere is approached.

(14) In passing from the chromosphere to the prominences, some lines become relatively brighter but others dimmer. The same line sometimes behaves differently in this respect in different prominences.

(15) The prominences must be fed from the outer parts of the solar atmosphere, since their spectra show lines which are absent from the spectrum of the chromosphere.

(16) The absence of the Fraunhofer lines from the integrated spectra of the solar surroundings and uneclipsed photosphere shortly after totality need not necessarily imply the existence of a reversing layer.

(17) The spectrum of the base of the sun's atmosphere, as recorded by the prismatic camera, contains only a small number of lines as compared with the Fraunhofer spectrum. Some of the strongest bright lines in the spectrum of the chromosphere are not represented by dark lines in the Fraunhofer spectrum, and some of the most intense Fraunhofer lines were not seen bright in the spectrum of the chromosphere. The so-called "reversing layer" is therefore incompetent to produce the Fraunhofer spectrum by its absorption.

(18) Some of the Fraunhofer lines are produced by absorption taking place in the chromosphere, while others are produced by absorption at higher levels.

(19) The eclipse work strengthens the view that chemical substances are dissociated at solar temperatures.

May 7.—"On the Occurrence of the Element Gallium in the Clay-Ironstone of the Cleveland District of Yorkshire." By Prof. W. N. Hartley, F.R.S., and Hugh Ramage.

The evidence of the existence of gallium in the ore and in the metal rests on the measurements of the wave-lengths of the lines in a large number of photographed spectra and upon the relative strengths of the lines in the different materials examined and in the precipitates obtained therefrom.

Examples are given showing the nature of this evidence.

Chemical Society, April 23.—Mr. A. G. V. Harcourt, President, in the chair.—The following papers were read:—The constitution of the cereal celluloses, by C. F. Cross, E. J. Bevan, and C. Smith. The cereal celluloses may be resolved by acids into a residue of normal cellulose and a soluble furfuroid con-