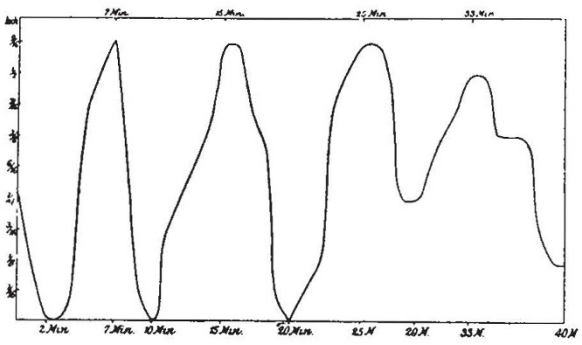
be the first recorded on a Scottish loch, with the possible exception of a considerable rise and fall of the water of Loch Tay in 1784, which has been considered an example of this phenomenon.



The accompanying curve represents the variations in level observed on Loch Trieg, the ordinates representing periods of one minute and the abscissæ changes of $\frac{1}{16}$ inch in the level.

THE MINING STATISTICS OF THE WORLD.

OWING to the lack of uniformity and the want of completeness in the official statistics published in the countries where mining and quarrying are carried on, the compilation of the mineral statistics of the world is a task of extreme difficulty. The work is, however, carried out every year with conspicuous success by Prof. C. Le Neve Foster, F.R.S., in the Home Office general report on mines and quarries. The fourth part of this report, which has recently been issued, deals with the colonial and foreign statistics for 1900, and constitutes a work of reference of permanent value. It is impossible to imagine a more concise, a better arranged, or a more inexpensive collection of comparative mineral statistics. Last year's report was noticed at length in NATURE (April 4, 1901, p. 551), and as the general arrangement has been closely followed in the new issue, the nature of the work may best be called to mind by citing a few of the more important figures that furnish a comparison as regards labour, output and safety in various parts of the world.

The following figures are given for the world's mineral production in 1900 :—

	The World.	British Empire.	United Kingdom.	United States.
Coal, metric tons ...	767,636,204	247,938,725	228,794,919	244,901,839
Iron, metric tons ...	40,427,435	4,987,641	4,741,835	14,014,475
Copper, metric tons..	534,735	41,456	777	275,008
Lead, metric tons ...	787,841	73,203	24,755	245,757
Tin, metric tons ...	80,643	51,624	4,336	—
Zinc, metric tons ...	446,373	13,417	9,211	112,419
Petroleum, metric tons...	18,553,950	241,344	—	7,485,579
Salt, metric tons ...	12,572,076	3,131,029	1,891,217	2,650,075
Fine gold, kilogrammes	393,196	188,491	415	119,913
Fine silver, kilogrammes	5,874,284	582,932	5,936	1,862,829

The figures given show that although Great Britain has had for a second time to give to the United States the first place in the production of coal, the British Empire as a whole is still the largest producer of solid mineral fuel, yielding nearly one-third of the world's output. The gold output of the British Empire is also the largest, and will probably increase. The United States, however, comes first in the production of the ores of copper, iron and lead. The German Empire, with 153,350 tons, is the largest zinc producer, and Russia, with 9,827,822 tons, is the largest producer of petroleum. Thanks to Tasmania and the Federated Malay States, the British Empire possesses the most productive deposits of tin ore.

The comparison of the figures relating to labour gives some interesting results. In 1900 the number of persons employed in the mines and quarries of the various countries was as follows :—The world 4,475,355, the British Empire 2,883,200, the United Kingdom 908,412, the United States 506,830 (returns incomplete), Germany 733,683, France 309,815, Belgium 171,467, Austria-Hungary 226,330, Russia 286,983, Italy 102,728, and Japan 119,667.

As regards the safety of its miners, Great Britain takes a high place. The number of fatal accidents in collieries per 1000 persons employed was as follows in the year under review :—Great Britain 1·29, Germany 2·19, Austria 1·08, France 1·42, Belgium 1·05, and United States 3·29 In the United States the death rate, both in bituminous coal mines and in anthracite mines, is considerably higher than in the United Kingdom. The rapid extension of machine mining in the United States is very remarkable. In 1891, it is stated, only 6·7 per cent. of the output of bituminous coal was obtained by the aid of coal-cutting machinery ; in 1900 the proportion had risen to 25 per cent.

The abundant and accurate references to current literature given in footnotes form a very valuable feature of the report. Hundreds of books, pamphlets and newspapers in various languages have been consulted, and much interesting information derived from them is recorded.

In one or two cases, statements are quoted that are, perhaps, open to criticism. For example, the statement that Dr. Carl Peters gives many excellent reasons for supposing that Macombe's country, south of the Zambesi, in Portuguese East Africa, is the Ophir of Scripture hardly gives a correct impression of the prolonged controversy as to the site of Ophir. Moreover, so competent an authority as Prof. A. H. Keane has recently decided in favour of the south of Arabia. Ophir, he shows, was not the place at which the gold, to which it gave its name, was found ; it was the emporium to which the products of the east and south were brought and from which they were distributed. Another statement which is not strictly accurate is that the yield of the oil wells of the United States almost equals that of all the rest of the world put together. In view of the fact that the Russian output is given as 2,342,243 metric tons more than that of the United States, this statement is somewhat misleading.

It is interesting to note the effect of the war in South Africa on the mineral production. In the Transvaal the output of gold was small ; and in Natal until March 1900 all the collieries were in the possession of the invaders, the output of coal being consequently comparatively small. In the Orange River Colony mining was carried on under very great difficulties and upon a very reduced scale. In Cape Colony the siege of Kimberley and the war generally interfered greatly with mining. In Rhodesia, however, the output of gold showed a steady increase, and the future prospects of the industry have been much brightened by the discovery of rich deposits of coal. In the Wankie coalfield alone, which lies 190 miles north-west of Buluwayo, the workable seams are considered capable of yielding 1500 million tons of coal.

It is impossible within the limits of this notice to refer to all the points of interest suggested by the report ; but enough has been said to show to how wide a circle of readers this invaluable work of reference appeals. B. H. B.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

OXFORD.—An examination for one geographical scholarship of the value of 60*l.* will be held on October 14. Candidates, who must have taken honours in one of the final schools of the University, should send in their names to the Reader in geography not later than October 1. The scholar elected will be required to attend the full course of instruction at the school of geography during the academic year 1902–1903, and to enter for the University diploma in geography in June, 1903.

CAMBRIDGE.—The Mathematical Tripos list, Part i., was published on June 10. The senior wrangler this year is Mr. E. Cunningham, St. John's College. Mr. F. Slator, also of St. John's, is the second wrangler.

The Rede lecture was delivered in the Senate House on June 10 by Prof. Osborne Reynolds, F.R.S., the subject being "On an Inversion of Ideas as to the Structure of the Universe."

The honorary degree of Doctor of Science has been conferred upon Principal Rücker, F.R.S., and Sir H. H. Johnston.

SOME remarks upon the subject of medical education were made on June 5 by Mr. Asquith, M.P., at the festival dinner of the London Medical Graduates' College and Polyclinic. He expressed the opinion that in all the professions England compares most unfavourably with America, Germany and most other countries in the lack of provision for the continuation of education in its technical and applied forms after the ordinary term of academic life has been reached. Medicine, which is at the same time a science and an art, is every year receiving vast accumulations of new observations and new experiments which must profoundly modify the conception of both the theory and the treatment of disease. Adequate provision must therefore be made for post-graduate research if scientific knowledge of disease is to be increased.

THE thirty-seventh annual programme just received from the Massachusetts Institute of Technology contains a full statement of the courses of instruction at this well-known institution and a register of the alumni, the whole publication forming a prospectus of more than four hundred pages. The Institute offers thirteen separate courses in applied science, each of four years' duration. The laboratories of the Institute are numerous and extensive; their equipment is correspondingly ample, and is kept well up to the rapid advances in technical practice. Provision is made for exact general training in the problems of physics and chemistry for highly specialised work in these and other sciences, and for engineering tests and processes on a practical scale. The large number of students at the Institute, no less than the increasing demands of modern scientific education, have made necessary new laboratories for the departments of electrical engineering and physics. Buildings of a most complete kind have been designed for these purposes, and their erection will be begun early in the spring of 1902. They will cost, with their equipment, between 400,000 dollars and 500,000 dollars.

THE second volume of the report of the United States Commissioner of Education for the year 1899-1900 is a closely printed book of 1368 pages. The series to which it is the latest addition does for educationists what the annual reports of the Smithsonian Institution do for men of science. There is to be found brought together in these portly volumes everything of importance which has taken place, not only in American education, but in that of all the great countries of the world. The plan adopted in the Smithsonian reports, of reprinting valuable contributions collected from various sources, is followed in the volume before us, with the result that many of the addresses and essays by English educational authorities, to which attention has been directed from time to time in these columns, are here to be found printed in full. The prominence given to the higher grades of education shows very clearly that, while making strenuous efforts to perfect their systems of primary and secondary education, the authorities in the States are not losing sight of the paramount importance of technical and university work. Chapters are given to "Institutions for Higher Education," "Professional Schools," "Agricultural and Mechanical Colleges," and "Commercial and Business Schools." Though few teachers can find time to study the reports brought out from year to year, much of the information contained in the volumes is of permanent value and will often be referred to by students of education.

SEVERAL points in the revised regulations for matriculation at the University of London are worthy of notice. The list of subjects has already been given (p. 69). There are only two obligatory subjects—English and elementary mathematics. Latin is optional with one of several sciences; and two other subjects have to be selected from a list of twenty branches of knowledge. Under the new regulations, therefore, it will be possible to matriculate at the University of London, and to proceed to a degree, without taking any science subject. The short syllabus of mathematics shows the influence of the reformer. Under arithmetic mention is made of the metric system, contracted methods, approximations to a specified degree of accuracy, and practical applications. Algebra includes graphs of simple rational integral algebraic functions. In geometry the subjects of Euclid I.-IV. will be taken, but Euclid's proof will not be insisted upon. The short syllabuses of optional sciences are prefaced by the remark "The examinations in science shall aim at ascertaining whether candidates possess a knowledge of fundamental scientific methods, acquired by observation of nature or by a simple course of experiment in physical measurement, or by the investigation of simple problems and commonly occurring phenomena illustrating natural laws." In all the science subjects the questions set will have regard to the conditions under which these subjects may best be experimentally taught in schools.

A SERIES of resolutions in regard to the Government Education Bill were adopted at a special general meeting of the Association of Technical Institutions on May 29 The resolutions are to the following effect:—(1) That the Association approves the general principles upon which the Government Education Bill is based, and strongly urges the Government to pass the Bill in the present session of Parliament. (2) That the new local authorities should be responsible for all grades of education in their districts, and that proper educational coordination would be seriously and unnecessarily hindered if this principle were not adopted; the Government is therefore urged to amend the Bill by deleting the clauses making it optional for the County and Borough Councils to undertake the supervision of elementary education. (3) That the Government should make compulsory the application to the purposes of higher education of the residue under the Local Taxation (Customs and Excise) Act, 1890. (4) That, insomuch as the Local Authorities constituted by the Bill will have to make good the deficiencies in elementary and general secondary education, as well as to support and improve technical education, and will be obliged to raise increased rates in order to do this efficiently, it is feared that in many cases these authorities will shrink from the necessary expenditure unless encouraged by increased aid from the national exchequer. The Government is therefore asked to promise to provide larger sums for educational purposes. (5) That there should be no statutory limit to the amount to be expended on higher education. (6) That the majority of the Education Committee should be appointed by and from the council of the County Council or County Borough Council. (7) That any attempt to alter the provisions of the first two sections of clause 18 of the Education Bill will be resisted. (8) That London may receive attention early next year, and that it would be unwise to depart from the general principles of the present Bill in the case of the metropolis.

THE ideal University for London, described by Prof. E. H. Starling, F.R.S., in the Foundation Day oration delivered at University College, London, on June 5, was much the same as that advocated in these columns on several occasions. Prof. Starling said that in the University there would be a centre in each of the four quarters of London. Each of those centres would be in so far a complete University in that it would be a place for study and research in all branches of knowledge and would be a community of teachers and scholars. The local business affairs of each centre would be under the control of a committee or council appointed by the senate of the University, but containing representatives of the local body of professors. All those centres would be but parts of this University, with common aims, with similar curricula, and the same standard of examination. The senate of the University, which would contain representatives from all centres, would be responsible for the appointment of the local governing bodies and would keep in its own hands the power of appointing and dismissing professors. It would be possible in that way to provide for the training of 10,000 students within the University of London, and to ensure the freedom of teaching and research and the living contact of each student with men of different ideals and modes of thought, which were the most valuable factors in a University training. Such a University could not be founded without the possession of adequate means. Each centre would necessitate the erection of buildings at a cost of about 500,000*l.* on ground covering from five to ten acres. For a moderate endowment of its professorships and the maintenance of its laboratories a yearly income of 50,000*l.* should be provided in addition to the income from students' fees, which might amount to another 30,000*l.* These might seem large sums to those who were ignorant of the money spent abroad by the State on Universities or of the income which was available from ancient endowments at Oxford and Cambridge. The united income of of the colleges at Oxford was 330,000*l.* a year, and at Cambridge nearly 300,000*l.* a year. The yearly Government grant to the University of Strasburg, with only 1000 students, was 50,000*l.* He was convinced that there would be no difficulty

in raising those amounts in London, either by the generosity of its rich men or by grants from public funds, if only those interested in the making of a University would combine their efforts towards a common end. The task was rendered easier by the fact that in the building of the University they could utilise for University purposes in London many of the buildings and endowments already existing, and it was in the hope of inaugurating a common movement in that direction that University College had declared itself ready to be incorporated in the University.

SCIENTIFIC SERIALS.

Transactions of the American Mathematical Society, vol. iii. No 2, April.—E. W. Brown, on the small divisors in the lunar theory.—J. W. Young, on the holomorphisms of a group. This deals with non-abelian groups such that there is a one-one correspondence between the elements of the group and their ath powers.—F. R. Moulton, a simple non-desarguesian plane geometry. A simpler system than that given by Hilbert in his "Grundlagen der Geometrie," with a proof that his axioms I. 1–2, II., III., IV. 1–5, V. are fulfilled, while Desargues' theorem is not true.—M. Bôcher, on the real solutions of systems of two homogeneous linear differential equations of the first order. Propositions relating to $y' = Py - Qz$, $z' = Ry - Sz$ analogous to those given by Sturm for $y'' + py' + qy = 0$.—Charlotte A. Scott, on a recent method of dealing with the intersections of plane curves. The method in question is that of F. S. Macaulay (*Proc.* L.M.S. vols. xxxi., xxxii.).—E. V. Huntington, a complete set of postulates for the theory of absolute continuous magnitude. Six postulates are laid down, and shown to be consistent and independent of each other. A short paper by the same author follows, on the postulates for the theories of positive integral and positive rational numbers.

Bulletin of the American Mathematical Society, second series, vol. viii. No. 8, May.—C. J. Keyser, concerning the angles and the angular determination of planes in 4-space.—D. R. Curtiss, note on the sufficient conditions for an analytic function.—Reviews:—Scheffer's "Theory of Surfaces," by J. M. Page; "Some Recent Books on Mechanics," by E. B. Wilson; "The Galois Theory in Burnside and Panton's Theory of Equations"; and shorter notices.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, March 20.—"On a Peculiarity of the Cerebral Commissures in certain Marsupialia, not hitherto recognised as a Distinctive Feature of the Diprotodontia," by Prof. G. Elliot Smith, M.D., Ch.M. Communicated by Prof. G. B. Howes, F.R.S.

It has been known for a considerable time that some of the fibres of the ventral commissure of the cerebrum in certain marsupials, instead of passing bodily into the *external* capsule, form an aberrant bundle, which associates itself with the *internal* capsule so as to reach the dorsal area of the neopallium by a shorter and slightly less circuitous course.

This peculiarity has been recorded by the late W. H. Flower, by Johnson Symington and by Theodor Ziehen in Macropus, Phascolomys, Aepyprymnus, Phascolarctus and the Derbian Wallaby, and in Phalangista by myself.

In 1894 I showed that while in the monotreme and Perameles the common mammalian relationship of the ventral commissure to the external capsule was found to obtain, in Trichosurus and Macropus some fibres of the ventral commissure were found to pursue the aberrant course indicated above. It was perhaps not unnatural to suppose that the increased size of the neopallium in these two genera was wholly responsible for the presence of this aberrant bundle; for it seemed that since the commissural fibres of the neopallium had become too abundant to be wholly accommodated by the path provided by the external capsule, they, so to speak, had overflowed into the internal capsular route.

Upon examining later a much larger series of marsupials, I soon became convinced that the explanation of the causation of this peculiarity which I then suggested could not be regarded as alone sufficient. I found the aberrant bundle in all members of the genera Macropus, Halmaturus, Hypsiprymnus, Dendrolagus, Trichosurus, Petaurus, Phascolarctus and Phascolomys, quite irrespective of the size of the brain and extent of the neopallium; but I sought it in vain in Perameles, Sarcophilus, Dasyurus, Sminthopsis, Didelphys, Myrmecobius, and Notoryctes, even though many of these genera possess larger brains than some Diprotodonts.

These facts seemed to suggest that the aberrant bundle was a distinctive feature of the Diprotodont marsupials, and it appeared that the crucial test of this hypothesis would be afforded by the brain of Thylacinus, which, although that of a Polyprotodont, is almost, if not quite, as large as the brain of the largest Macropod. I accordingly submitted the cerebrum of Thylacinus to the test, and found no trace of the aberrant bundle, wherefore it is clear that the presence of this aberrant fasciculus of the ventral commissure is distinctive of the Diprocdontia.

The most pronounced growth tendency in the earliest mammals must have been an enormous increase in extent of the neopallium, for while at the beginning of the Eocene period this was almost as insignificant as it is in the Reptilia, in most recent mammals it attains a bulk which far exceeds that of the whole of the rest of the nervous system. This sudden expanse of the neopallium would lead to the development of an enormous mass of fibres which must find some outlet from the pallium; and there are only three possible routes for commissural fibres of the neopallium to the mesial plane. There is first the external capsule, which chiefly consists in all mammals of such fibres passing to the ventral commissure; we find the second route in the path mapped out by the internal capsule from the dorsolateral neopallial area to it; and the third route can only involve the invasion of the alveus of the hippocampus.

All the neopallial commissural fibres in the Polyprotodontia and *some only* of these in the Diprotodontia and Eutheria follow the first route. The commissural fibres, which spring from the dorso-lateral region of the neopallium in the Diprotodontia, crowded out of the first route pursue the second. In the Eutheria the neopallial commissural fibres from the dorso-lateral region of the hemisphere forsake both the first and second routes and invade the alveus, so as to form a new dorsally situated neopallial commissure, which is the corpus callosum.

This hypothesis of the origin of the corpus callosum I have previously stated and discussed; and I refer to the matter now merely to point out that the same determining cause which in the Eutheria calls the "corpus callosum" into being is probably functional in bringing into existence the "aberrant bundle" in the Diprotodontia.

The development of any such commissural mass as the corpus callosum of the more highly organised Mammalia in the position occupied by its homologous fibres in the monotremes and marsupials would cause the most profound disruptions of the corpus striatum, optic thalamus, and the basal region of the brain, and the complete disorganisation of its whole; and hence the new course taken by its fibres in the Eutheria.

May 15.—"Cyanogenesis in Plants. Part II.—The Great Millet, *Sorghum vulgare*," by Wyndham R. Dunstan, M.A., F.R.S., Director of the Scientific Department of the Imperial Institute, and T. A. Henry, D.Sc. Lond.

May 29.—"On the Structure of the Gills of the Lamellibranchia," by Dr. W. G. Ridewood. Communicated by E. Ray Lankester, M.A., F.R.S.

This paper records the results of an investigation undertaken at the instance of Prof. E. Ray Lankester, F.R.S., and carried on under his supervision. 215 species of Lamellibranchia, belonging to 118 genera, were examined. The results demonstrate that although the minute structure of the gill, like the grosser structure, cannot be taken as a criterion of genetic affinity, three main types of structure can be recognised, representing apparently three grades of complexity.

The first type is distinguished by the mutual freedom of the gill leaflets into which the embryonic gill papillæ expand. In the other two types the embryonic papillæ elongate into filaments, which are held in juxtaposition by interlocking cilia, or by horizontal bars of cellular tissue.

Evidence is produced to show that Pelseneer's order Pseudolamellibranchia is based largely on a misconception of the relative value of the flatness or plication of the gill lamellæ, and the presence or absence of principal filaments.

In the family Solenidæ particularly it is shown that different species and subgenera of the same genus may have their gill