In a communication to the Royal Academy of Belgium (Bulletin No. 7, p. 452) Prof. Walthère Spring shows that the material obtained by decomposing a solution of hydrogen sulphide with sulphur dioxide, and formerly described as δ sulphur by Debus, who considered it to be an allotropic form of the element, is in reality a hydrate having the composition $S_8,H_2O$. The hydrate has at the ordinary temperature a vapour pressure much smaller than that characterising most hydrates. When, however, it is exposed for a long period in a vacuum it gradually loses water, a form of sulphur being produced which differs from the known forms in its regenerating the hydrate when left in contact with water. It is interesting to note that the composition of the hydrate corresponds with the molecular weight $S_8$, which has been found by physical methods to characterise sulphur in solution.

Mr. W. B. Clive has published a second edition of "Graphs: or the Graphical Representation of Algebraic Functions," by Messrs. C. H. French and G. Osborn. The book has been expanded, chapters having been added on harder graphs and on the slope of a graph.

A second popular edition of Mr. Oliver Pike's "In Bird-land with Field-glass and Camera" has been published by Mr. T. Fisher Unwin. The first edition of this attractive volume was reviewed in our issue of August 30, 1900 (vol. lxii., p. 417), and it is unnecessary to add anything to the favourable opinion then expressed.

We have received tickets for Mr. Otho Stuart's revival of *A Midsummer Night's Dream* at the Adelphi Theatre. We are glad to know that the management is presenting this delightful comedy, which, unlike many of the modern plays, is not based upon impurity or inanity, but provides all who see it, whether children or adults, with innocent enjoyment and real delight. An arrangement has been made by which schools and parties of students may receive special terms of admittance, for particulars of which application should be sent to Mr. C. F. Level at the Adelphi Theatre.

A second edition of Mr. J. H. Stansbie's "Introduction to Metallurgical Chemistry for Technical Students" has been published by Mr. Edward Arnold. The book assumes that those who use it are practically interested in the common metals, but have only the knowledge of their properties gained by every-day observation in the workshop or foundry. The scientific study of the subject consequently starts at the beginning. The text is practical in character, and will be useful to the technical students for whom it is intended.

## *OUR ASTRONOMICAL COLUMN.*

Systematic Stellar Motions.—In a paper submitted to the Royal Astronomical Society Mr. A. S. Eddington discusses the proper motions of the stars contained in the Greenwich-Groombridge catalogue from the point of view that they are not haphazard, but may be considered as belonging to two defined systems.

It has been generally assumed that these proper motions were proper to the individual stars only, but Prof. Kapteyn recently concluded that this assumption was erroneous, and that they might be classified into two "drifts," which are in relative motion, the one to the other. Mr. Eddington's results confirm this theory quantitatively. In each drift the velocities relative to the system of axes of the drift are quite haphazard, but this system of axes has a velocity which is defined as the velocity of that drift.

On analysing the figures obtained for the regions discussed, in order to find the directions of the two drifts in each region, Mr. Eddington found that the stars of drift i. have a common velocity, relative to the sun, away from a point near to R.A. 18h., dec. +18°, and that the best point for the apex of drift ii. is about the position R.A. 7h. 30m., dec. +58°. The velocity of the first drift relative to the sun is much larger than that of the second, the ratio being about 17 : 5, and from an investigation of the *magnitudes* of the proper motions there appears to be no appreciable difference in the mean distances of the stars of the two drifts (the *Observatory*, No. 377).

The Spectrocomparator.—An extremely interesting instrument, devised for the measurement of the spectral displacements in the determination of stellar radial velocities, is described by Dr. J. Hartmann in No. 4, vol. xxiv., of the *Astrophysical Journal*.

The usual method employed in measuring the "Doppler" displacement has been to measure the displacement of each individual stellar line in regard to the corresponding line in a terrestrial spectrum, but in Dr. Hartmann's instrument a large number of lines are compared with those of a standard solar spectrum at one time, so that a stellar spectrum rich in lines, which would, by the older method, have taken days to measure, may now be measured in an hour or two. Details, too numerous to mention here, are given in Dr. Hartmann's paper, and are well illustrated by diagrams and worked examples.

Measurements of the Effective Wave-lengths in Stellar Spectra.—The position of the "effective" wave-lengths in stellar spectra, that is, the position of the radiations which, in the combined radiations of a complete spectrum, appeal most strongly to the eye, is of great importance in double-star observations. For this reason Dr. H. E. Lau has determined this position in seventy stars, by Prof. Comstock's interference method, and publishes the results in No. 4134 of the *Astronomische Nachrichten*.

The stars which have been examined are arranged in groups according to the Harvard classification, and the distance between the conjugate spectra of the first order is given for each object. This quantity may be converted into wave-lengths by the application of a known factor.

Early Observations of Jupiter's Sixth Satellite.—On examining the Harvard photographs of Jupiter, Miss Leavitt found the image of the sixth satellite on two taken in 1894 and on nine taken in 1899. These plates were measured, and the results of the measures and their reduction are given and discussed in No. ii., vol. lx., of the Annals of Harvard College Observatory. It appears that Miss Leavitt marked and measured this satellite when examining some of these plates on December 10, 1904, but concluded that it was probably an asteroid near to its stationary point.

Observations of the August Meteors.—In No. 4132 of the *Astronomische Nachrichten* Prof. von Konkoly records the results of some meteor observations made at the O-Gyalla Observatory in July and August last. These results show that the maximum of the shower occurred on August 12, on the night of which 158 meteors were observed at O'Gyalla and 251 at the subsidiary station at Nagy-Tagyos. On August 13 the corresponding numbers were 111 and 175.

## *GEOLOGY IN THE UNITED STATES AND CANADA.*

Glacialists will be interested in the short sketch of the drumlins of south-eastern Wisconsin contained in Bulletin No. 273 of the U.S. Geological Survey.[1] It is a preliminary record of a detailed study of the post-Pleistocene deposits of the district which embraces part of the ground moraine of the Green Bay glacier—in which most of the drumlins lie—and part of that of the Lake Michigan glacier, as well as an earlier Iowan or Illinoian glaciation. The relations of the drumlins to eskers and to the terminal moraines and rock mounds were investigated. The map shows most clearly the arrangement of the drumlins to correspond with the lines of flow of the deploying glacier.

Bulletin No. 265[2] contains a short account of the struc-

[1] Bulletin No. 273. "The Drumlins of South-eastern Wisconsin." (Preliminary Paper.) By W. C. Aldin. (1905.)
[2] Bulletin No. 265 "Geology of the Boulder District of Colorado." By N. M. Fenneman (1905.)

ture and stratigraphy of the district, and such features as mesas, slip faults, and lake basins are incidentally described. The well-known Wyoming beds are still tentatively retained in the Triassic system on very poor evidence, and notwithstanding the different interpretation placed upon them by Mr. Darton. The main purpose of the paper is to explain the position of the oil-bearing beds at Boulder. These are shown to be irregular sandstones in the Pierre shales (Cretaceous). The paying beds are limited to a narrow line over the crest of a shallow anticline and over one or two subsidiary folds. Much time and money appear to have been wasted through carelessness in keeping the journals of bore-holes, and by the reckless "shooting" of the wells.

Not long ago we had occasion to notice a bulletin by Mr. T. N. Dale dealing with the much-discussed Taconic area. The same author has now (Bulletin No. 272 [1]) called upon his long experience of the region to produce in a pamphlet, of no more than fifty pages, a charmingly lucid exposition of its physical geography. With the maps, sketches, and photographs, this will be an ideal guide-book to the district for intelligent students.

In Professional Paper No. 43 [2] Mr. Lindgren gives a detailed description of one of the largest copper-producing districts in the United States. The oldest rocks are pre-Cambrian granites and schists; over them lie Palæozoic formations, comprising Cambrian quartzites, Ordovician limestones, shales possibly of Devonian age, and pure limestones of the Carboniferous. Resting unconformably upon the Palæozoic strata are Cretaceous shales and sandstones. After the deposition of the latter formation, a second granitic intrusion, with dioritic porphyries, penetrated the rocks in sheets, laccolites, and dykes. Then there followed a period of uplift and faulting, succeeded by great volcanic effusions of basalt, rhyolite, and some andesite. A remarkable Quaternary deposit, the Gila conglomerate, at the foot of the mountains bears witness to the erosion that has exposed the older rocks in the centre of the district.

The ore deposits are primarily dependent upon the intrusions of porphyry; where it came in contact with the limestones and shales of the Palæozoic series extensive contact metamorphism resulted, not only near the main mass, but within the range of influence of the numerous dykes. The limestone has suffered most, in some cases being converted into an almost solid mass of garnet. Magnetite, pyrite, chalcopyrite, and zinc blende appear to have been intruded into the altered rock from the porphyry magma. Subsequently, oxidising waters have converted the sulphides into carbonates; malachite and azurite are the most common ores. The zinc blende has been carried away as zinc sulphate. The magnetite and garnet have been much decomposed, yielding silica and limonite.

These ore bodies, though somewhat irregular, are mostly worked along the bedding, frequently by tunnels, since they lie at no great depth. In addition to the above ore bodies, there are numerous veins of pyrite, chalcopyrite, and zinc blende; these have been greatly enriched by the secondary deposition of chalcocite on the pyrites, both in the veins themselves and in the adjoining impregnated porphyry. Some interesting observations are made on the action of sulphuric acid solutions, and on the influence exerted by kaolin in enriching the ore. A new mineral species, coronadite, a lead-bearing manganite, is described on pp. 103–5.

This paper contains a good deal of interesting matter, and is illustrated by good maps and a series of capital photomicrographs of the ores within the rocks.

The thoroughness with which the U.S. Geological Survey tackles problems of local water supply could not be better exemplified than by Professional Paper No. 44.[1] Naturally the greater part of this bulky volume is occupied by material of purely local interest, that is, with detailed descriptions of well sections, but the brief outline of the geology of Long Island and an account of the elaborate procedure adopted for determining the rate of flow in underground water are capable of more general application.

British geologists will be interested to note the suggestion to use the terms "wold" and "vale" in a restricted sense to replace the rather loose use of escarpment and cuesta, which are here more precisely defined; but of more importance, and quite opportune, are Mr. Veatch's conclusions as to the cause of the folding of strata at Gay Head; this he unhesitatingly ascribes to the thrust or drag of a continental ice-sheet. The volume is liberally supplied with maps.

The fifth volume of the General Reports of the Maryland Geological Survey [2] is, as usual, a businesslike and well-finished production. It contains the second report on the magnetic work in Maryland, by L. A. Bauer; the third report on the highways of Maryland, by A. N. Johnson; and an elaborate report on the coal deposits of the State, by Prof. W. B. Clark and others.

Bulletin No. 268 [3] contains a descriptive account of

FIG. 1.—Bald of Big Yellow Mountain, Mitchell County, N.C. From "Southern Appalachian Forests."

Foraminifera collected by Prof. J. C. Branner from the Monterey shale on Rancho del Encinal, near Asuncion Station, in San Luis Obispo County, California. The reader is left in some confusion after studying the brief prelude to the detailed descriptions of Foraminifera, for Prof. Branner, who writes the geological introduction, makes it clear that the shaly series is very frequently sandy, and definite interbedded sandstones are not uncommon. On the other hand, Mr. Blagg (p. 11) makes the statement that "The absence of the arenaceous genera undoubtedly shows the purity of the waters in oceanic circulation during the Miocene, and this evidence is still further substantiated by the fine argillaceous and silt character of the deposit in which the Foraminifera are deposited (*sic*). The Foraminifera, in fact, constitute a large portion of the entire mass of the marl itself." On the previous page (p. 10), however, Prof. Branner says, "the bulk of this shale is made of diatom skeletons." Plate i., representing a sandstone intrusion in the Monterey shale, is by no means a convincing illustration.

The fossils described in Bulletin No. 266 [4] were all collected from the Malone Mountain and the immediate

1 Bulletin No. 272. "Taconic Physiography." By T. N. Dale. (1905.
2 Professional Paper No. 43. "The Copper Deposits of the Clifton-Morenci District, Arizona." By W. Lindgren. (1905.)

1 Professional Paper No. 44. "Underground Water Resources of Long Island, New York." By A. C. Veatch, C. S. Slichter, I. Bowman, W. O. Crosby, and R. E. Horton. (1906.)
2 Vol. v. Maryland Geological Survey. (1905.)
3 Bulletin No. 268. "Miocene Foraminifera from the Monterey Shale of California." By R. M. Bagg, jun. (1905.)
4 Bulletin No. 266. "Paleontology of the Malone Jurassic Formation of Texas." By F. W. Cragin, with notes by T. W. Stanton. (1905.)

neighbourhood. Notwithstanding the presence of the genus Ptychomya, the affinities of its fauna clearly refer the Malone formation to the Jurassic system. New species of Perisphinctes, Olcostephanus, Nautilus, Trigonia, Natica, Nerinea, Nerinella, Martesia, Pholadomya, and others are figured and described.

Bulletin No. 270[1] contains records of borings and shallow excavations, with notes on the nature of the rock. From these data sectional elevations have been prepared traversing the district in many directions. Information of this kind, in the same handy form, would be of great value to engineers and contractors in the London area, as it is no doubt in New York.

Bulletin No. 267[2] contains a short discussion of the problem of the classification and nomenclature of the great series of alternating magnesian limestones and sandstones known as the "magnesian series" or "Ozark series" (Cambrian and Ordovician). The ore deposits do not appear to possess any striking features.

A short description of the stratigraphy of the region (mainly Carboniferous), with particulars of the mineral resources, is given in Bulletin No. 256.[3] There is a coloured map.

Taken together, Bulletins Nos. 247, 251, 263[4] give an

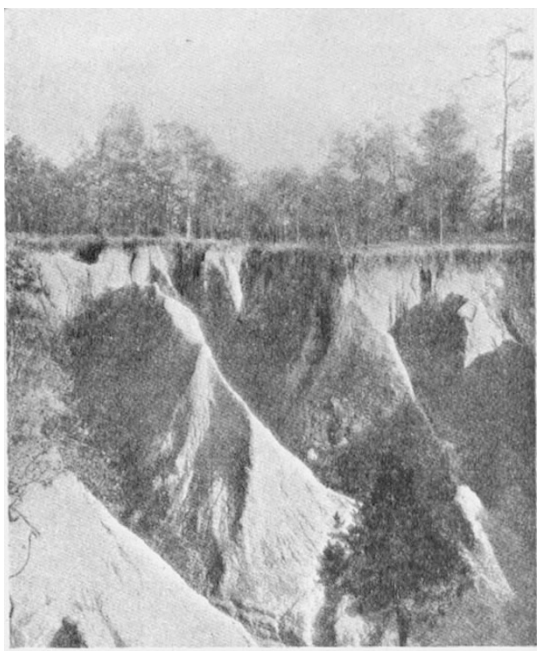

FIG. 2.—Land Erosion near Marion, N.C. Showing rapid erosion of soil by heavy rains when the forest cover is reduced or destroyed. From "Southern Appalachian Forests."

excellent survey of the conditions of gold mining in Alaska. Nos. 247 and 251 deal with the geology of their respective districts; No. 263 contains a wealth of information upon all the subjects that fall within the scope of the title, and no miner should venture to Alaska without a copy. All three bulletins are well illustrated.

A more generalised account of the same region is contained in "The Geography and Geology of Alaska," by A. H. Brooks (Professional Paper No. 45, 1906[5]). This well-illustrated volume deals with the climate, the drainage, the history of explorations and surveys, and the geology. In the last-named section an elaborate table is provided giving the correlation of the strata in the western United States and Canada. A bibliography is appended.

Professional Paper No. 41[1] contains a good deal of useful information upon the mineral resources of the central copper region. There is also a short account of the volcanic rocks of Mount Wrangell and of the glaciation of the Copper River basin. There are numerous interesting illustrations.

"The purpose of Mr. Alden's paper[2] is to throw, if possible, some fresh light on the relations which existed during the later stages of the Glacial epoch between the glaciers of south-eastern Wisconsin." It is an interesting study of the phases of glaciation and deglaciation in an area of moderate size. The principal facts are graphically illustrated in a series of admirable maps, prepared by the author to show the relations of the several glacial deposits at different stages.

Professional Paper No. 30. Parts of this volume[3] are excellent, but we are constrained to ask, For whom is it intended? Is it for the West Kentucky miner? Then why burden him with a dissertation on Carboniferous stratigraphy and palæontology? On the other hand, if it was meant for the help of palæontologists, why should their troubles be increased by recording new species under the title "Lead, Zinc, and Fluorspar Deposits"? As for the new species themselves, they may be found beautifully figured, but the diagnoses are very meagre.

The bulk of Professional Paper No. 37[4] is a dreary mass of statistics relating to the forest conditions of southern Appalachia, but it contains a number of illustrations which will appeal to all who are interested in problems of afforestation and water supply. The forest suffers from ill-regulated lumbering and from fires, but far more damage is done, not to the forest alone, but to the water supply, the scenery, and the agriculture of large districts by the clearing of land for farm purposes on high ground and steep slopes. The rainfall on the north-western slopes ranges from 40 inches to 50 inches, on the south-eastern slopes from 60 inches to 70 inches, and heavy downpours are common. The two figures here reproduced bring out very clearly the cause of the trouble and one of its effects.

In Professional Paper No. 38[5] is a careful description of the Bingham mining district, where low-grade copper and rich silver-lead ores occur in Carboniferous strata and in the later monzonite intrusions.

Professional Papers Nos. 40 and 47[6] are two important palæontological works; both are illustrated with a large number of beautiful plates.

It is not every mineral district that boasts of so elaborate a memoir as Professional Paper No. 42[7] within five years of its discovery. This paper deals with the geology, petrology, faults, and veins, and gives details of each of the mines. The temperature in the Tonopah mines shows an abnormally rapid increase with depth, comparable to that in the Comstock.

In Professional Paper No. 49[8] a general account is given of the Cumberland Gap coalfield, Kentucky. All the rocks of this basin are of the age of the Pottsville group of the Pennsylvanian coalfield. The field has only been exploited since 1892; eight seams are mined at present; their thickness ranges from 4 feet to 6 feet.

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[1] Bulletin No. 270. "The Configuration of the Rock Floor of Greater New York." By W. H. Hobbs. (1905.)
[2] Bulletin No. 267. "The Copper Deposits of Missouri." By H. O. Foster Bain and E. O. Ulrich. (1905.)
[3] Bulletin No. 256. "Mineral Resources of Elders Ridge Quadrangle, Pennsylvania." By R. W. Stone. (1905.)
[4] Bulletin No. 247. "The Fairhaven Gold Placers, Seward Peninsula, Alaska." By F. H. Moffit. (1905.) Bulletin No. 251. "The Gold Placers of Forty-mile, Birch Creek and Fairbanks Regions, Alaska." By L. M. Prindle. (1905.) Bulletin No. 263. "Methods and Costs of Gravel and Placer Mining in Alaska." By C. W. Purington. (1905.)
[5] Professional Paper No. 45. "The Geography and Geology of Alaska." By A. H. Brooks. (1906.)

[1] Professional Paper No. 41. "Geology of the Central Copper River Region, Alaska." By W. C. Mendenhall. (1905.)
[2] Professional Paper No. 34. "The Delavan Lobe of the Lake Michigan Glacier." By W. C. Alden. (1904.)
[3] Professional Paper No. 30. "The Lead, Zinc, and Fluorspar Deposits of Western Kentucky." By E. O. Ulrich and W. S. Tangier Smith. (1905.)
[4] Professional Paper No. 37. "The Southern Appalachian Forests." By H. B. Ayres and W. W. Ashe. (1905.)
[5] Professional Paper No. 38. "Economic Geology of the Bingham Mining District, Utah." By J. M. Boutwell and others. (1905.)
[6] Professional Paper No. 40. "The Triassic Cephalopod Genera of America." By A. Hyatt and J. P. Smith. (1905.) Professional Paper No. 47. "The Tertiary and Quaternary Pectens of California." By R. Arnold. (1906.)
[7] Professional Paper No. 42. "Geology of the Tonopah Mining District, Nevada." By J. E. Spurr. (1905.)
[8] Professional Paper No. 49. "Geology and Mineral Resources of Part of the Cumberland Gap Coalfield, Kentucky." By G. H. Ashley and L. C. Glenn.

for 1901 [1] (published 1905) contains, in addition to the summary report (published in 1902), a report on the Klondike goldfields, by R. G. McConnell, 1905; a report on an exploration of Ekwan River, Sutton Mill Lakes, by D. B. Dowling, 1904; Dr. Barlow's elaborate report on the nickel and copper deposits of the Sudbury mining district, 1904; and other papers. Both volumes are illustrated and accompanied by separate portfolios of maps. The volume for 1902–3 contains the summary reports for 1902 (published in 1903) and for 1903 (published in 1904). There is also a report on the coalfield of the Souris River, East Assiniboia, by D. B. Dowling, and the "Section of Mines" annual report for 1902.

## SCIENTIFIC FISHERY INVESTIGATIONS.

IN the unavoidable absence of the Chancellor of the Exchequer, Mr. R. M'Kenna received a deputation at the Treasury on December 18 in support of the application of the Marine Biological Association for a grant to continue the scientific fishery investigations which are at present being conducted in the North Sea and English Channel. The deputation was introduced by the Right Hon. Austen Chamberlain, M.P., ex-Chancellor of the Exchequer, and among those present were Prof. E. Ray Lankester (president of the Marine Biological Association), Sir Michael Foster, Sir William Ramsay, Mr. A. E. Shipley (chairman of the council), Sir Charles Eliot, Mr. Chas. Hellyer, Mr. J. A. Travers, Dr. Chalmers Mitchell, Prof. E. A. Minchin, and Dr. H. R. Mill.

In introducing the deputation, Mr. Austen Chamberlain stated that, as a former Chancellor of the Exchequer, it had been his duty to review the work which had been done by the Marine Biological Association, and he had come to the conclusion that it was most necessary, and that it had been efficiently performed. He considered that British Governments of both parties should do more to support both science and art. Prof. Lankester gave a brief account of the history of the Marine Biological Association, and explained the circumstances in which the association undertook, at the request of His Majesty's Government, to carry out the English portion of the international scheme of fishery investigations. He directed attention to the fact that the present application of the association for funds to continue their researches had received the special support of the Royal Society, which recorded in a strong minute its appreciation of the value and efficiency of the work being done.

Mr. A. E. Shipley said the Government has gained directly and in money by entrusting the North Sea work to the Marine Biological Association. He referred to the importance of extending over a sufficient period of years the kind of investigation which the association is making. Only so can the effects of secondary causes and exceptional fluctuations be eliminated from the essential, primary, normal factors. While time advances in an arithmetical progression so does the value of the results increase in a geometrical ratio. Mr. Shipley gave a short *résumé* of the work accomplished, and because it has furnished the problems of most pressing importance he confined his remarks chiefly to the plaice. During the last four years the association has devoted much hard work to tracing the life-history and the distribution of this species throughout the North Sea, with the result that many important facts concerning it have been established. Similar investigations have been carried on, but not yet so thoroughly, into the life-histories, the distribution, the migrations, and rate of growth of many of the other food fishes, the cod, the haddock, the sole, the turbot, and others. Special experiments have been made on the *Huxley* to determine the vitality and the extent of injury inflicted upon trawl-caught fish by the operations of trawling. The hydrographic observations and the investigations into the minute organisms which crowd the surface of the waters and form the ultimate food of fish have been efficiently carried on in accordance with the programme laid down by the international conferences. In this work especially, the Plymouth steamer, the *Oithona*, has supplemented and helped the *Huxley*. The association asked for a continuation of the grant which for the last five years the Government has made towards the expense of carrying on the English part of the North Sea international investigations. A grant of 6000*l*. a year is needed to continue the international work, and a grant of 2000*l*. for the work on the south coast, making a total grant asked for of 8000*l*. Next spring, for the first time, the International Congress has been invited to meet in England. There will be gathered together in London some thirty or forty of the leading men of science from Russia, Finland, Sweden, Norway, Denmark, Germany, Holland, and Belgium. It will be a pitiful thing, and also a deep humiliation, if we have to greet these gentlemen with the tidings that England, who takes from the North Sea far more than all the other eight countries together, more, in fact, than 90 per cent. of the total yield, is too impoverished to continue to do her share of this important work.

Sir Michael Foster, speaking on behalf of the British Science Guild, considered that the money asked for ought to be regarded as of the nature of an investment, and not as expenditure. He believed that scientific investigation was the only sound foundation upon which fishery legislation could be framed, and that experimental legislation, which was the only possible alternative to experimental research, would involve the country in far greater expenditure than the small sum required by the Marine Biological Association.

Mr. Charles Hellyer, chairman of committees of the National Sea Fisheries Protection Association, speaking as a practical man connected with the fishing industry, emphasised the importance to the industry of the knowledge being accumulated by the scientific investigations now in progress.

Mr. J. A. Travers, in the absence of the Prime-Warden, referred to the support which the Fishmongers' Company had always given to the work of the Marine Biological Association in the belief that an increase of scientific knowledge was bound to be advantageous to the best interests of the fishing industry.

Dr. H. R. Mill spoke of the very valuable results which had been obtained from the hydrographical work carried out in the North Sea and adjacent waters during recent years, and expressed the view that the time was not far distant when it would be possible to predict the movements of the migratory fishes from a knowledge of the hydrographical conditions of the sea.

Mr. M'Kenna, in reply to the deputation, stated that after what had been said there could be no question as to the value of the work upon which the Marine Biological Association was engaged. But the demands upon the national Exchequer were very heavy, and as a matter of experience they found that the satisfaction of one demand led to a number of others being brought forward. He promised to lay the views expressed by the deputation before the Chancellor of the Exchequer, who would, he had no doubt, give them his most careful consideration.

## AGRICULTURAL RESEARCH.

IN concluding a course of Cantor lectures at the Society of Arts on Monday, on the subject of "Artificial Fertilisers," Mr. A. D. Hall, director of the Rothamsted Experiment Station, pointed out that only by continued investigation and experiment can a knowledge be obtained of the conditions necessary to make the maximum profit out of the land, crops, and stock. The teacher can only hand on what is already known; and much yet remains unknown about the growth of our commonest crops and the action of standard fertilisers. Adequate provision for scientific investigation of agricultural matters is of national importance, as the following remarks made by Mr. Hall show; but though a few counties and other local bodies are carrying out demonstrations, Rothamsted, with its comparatively small endowment, remains practically our only experiment station where problems in agricultural science are studied with the object of making new knowledge, and State aid for research amounts only to a few hundred pounds a year for the whole country.

The grants of our Board of Agriculture for agricultural

[1] "The Annual Report of the Geological Survey of Canada for 1901." (1905.) With separate folio of maps. The Annual Report of the Geological Survey of Canada, vol. xv., 1902–3. (1906.)