

Hedley was an indefatigable worker and a voluminous writer, his published papers and articles totalling more than 160, and he was joint author of about twenty more. Most of these dealt with his special subjects, molluscs and zoogeography, but they also include botanical, ethnographical, and geological contributions. His earliest papers were mainly descriptive of the land shells of Queensland, but after his transfer to Sydney he devoted himself to general conchology, though he was always greatly interested in terrestrial molluscs, particularly in regard to their distribution and the evidence they offer as to the former relations of land and water. Some of his most useful contributions are various faunal lists such as "The Marine Fauna of Queensland" (*Rept. Austr. Ass. Adv. Sci.*, 1909, pp. 329-371); "A Check List of the Marine Fauna of New South Wales, Part 1, Mollusca" (Suppl. to *Jour. Roy. Soc. N.S. Wales*, 51, pp. M. 1-M 120, 1917). He was a contributor to the Reports of the Shackleton British Antarctic Expedition of 1907-1909, writing on the molluscs of the 'raised beaches' of McMurdo Sound, and he described the molluscs of Mawson's Australasian Antarctic Expedition of 1911-1914. He was the author of a delightful sketch of the ecology of the Sydney beaches (*Jour. Roy. Soc. N.S. Wales*, 69, pp. 15-77, 1915). One of his longest conchological papers was

his masterly "Revision of the Australian Turridæ" (*Rec. Austr. Mus.*, 13, pp. 213-359, 1922, 15 plates). He was skilled in pen-and-ink drawing, and many of his papers were illustrated by himself.

Hedley was a fellow of the Linnean and Malacological Societies of London; honorary member of the New Zealand Institute and of the Royal Societies of Victoria, Queensland, and Western Australia; corresponding member of the Zoological Society of London and of the Academy of Natural Sciences of Philadelphia. He was a past president of the Royal, the Linnean, and Royal Zoological Societies of New South Wales. In 1916 he gained the David Syme prize for scientific research, and in 1925 the Royal Society of New South Wales awarded him the Clarke Memorial Medal, the highest honour in its gift.

Hedley was completely absorbed in his work, which was also his hobby, and he was always ready to make sacrifices in the interests of scientific advancement. He was a most generous donor to the Australian Museum, both of specimens and works of reference, and many of his collecting trips, which invariably yielded a rich harvest of results, were financed by himself.

His body was cremated and the ashes scattered on the waters of the Great Barrier Reef, which he knew and loved so well.

C. ANDERSON.

### News and Views.

DR. JEANS'S article, which forms our supplement this week, may be regarded as a summing up of the hypothesis of stellar evolution and contributions which he has adumbrated in various publications for several years past. Even those who share neither his view-point nor his conclusions will be unable to withhold their admiration for the extreme ingenuity of the hypothesis and the masterly manner of its presentation. Indeed, it may even, somewhat paradoxically, arouse suspicion by its very perfection; it is so rarely that a complex phenomenon reveals its secret through so small a fragment of itself as is our actual, compared with our possible knowledge of the stars. We could scarcely have complained if more uncertainties had been left over for further observation to remove. The picture which Dr. Jeans unveils, of a vastly extended field for physics and chemistry, is an arresting one, but it is also very tantalising. The field, he tells us, is there, but we are never to enter it, being possibly merely a disease infesting the rubbish-heap in the corner.

As men of science, we must be prepared—to change the metaphor—for truth to be unpalatable, but we do not like to be debarred from the possibility of testing it. For that reason we may be permitted to hope that Dr. Jeans has not yet said the last word on the subject. The alternative views of Russell and Eddington likewise include phenomena unknown on the earth—namely, a transformation of matter into radiation which is a function of temperature and pressure—but such a transformation is not necessarily unknowable; if it takes place in the stars we may in time reproduce it terrestrially. Dr. Jeans, however, does not admit extra-terrestrial processes, but believes in extra-terrestrial matter. One possible

objection to his postulates which occurs to us is that it is not easy to conceive how such highly unstable material as his primitive atoms could have come into existence. Evolution from simple to complex implies an infinitely simple origin, which is intelligible, but the reverse process seems to require an infinitely complex origin, which appears to be absurd. We know, of course, that the radio-active elements exist, but a minute fraction of the total matter in the universe might plausibly be attributed to an evolutionary process (from simple to complex) overstepping itself in special circumstances. It is a different matter when the whole universe is regarded as radio-active.

ON November 27, the authorities of the city and cathedral of St. Albans joined in a commemoration of a distinguished man of science belonging to St. Albans, Richard of Wallingford, Abbot 1326-35. Ecclesiastically, the observance took the form of a "Solemn Evensong" in the cathedral. This was attended by the Mayor and Council, by representatives of the University of Oxford, particularly of Wallingford's own College of Merton, and by representatives of the Honourable Company of Clockmakers. At the end of the anthem a procession was formed up the aisle to the altar, where the Astronomer Royal presented a wreath to the Dean, who placed it on Wallingford's tomb within the sanctuary. Later, there was a well-attended meeting in the Town Hall, which was addressed by Profs. H. H. Turner and H. W. Garrod, Dr. Gunther, and Mr. Howgrave-Graham, of the Honourable Company of Clockmakers, on various aspects of Wallingford's work. Dr. Gunther also showed a small collection of medieval scientific instruments, which included a reproduction of "Walling-

ford's Rectangulus," made according to the working-drawings and descriptions which that most practical of medieval savants left behind him. The instrument was intended merely to supersede rather clumsy astrological instruments of the day, such as the 'armillary sphere' and the 'Torquetur,' but actually, as was pointed out, it opened the way to much that the inventor may not have foreseen. It was by far the handiest surveying instrument of its day for things on the earth as well as those in the heaven.

By his combined use of the 'rectangulus' and the plumb-line, Wallingford was led to see the usefulness of the right angle for purposes of measurement, and thus, as one of his treatises shows, was led to grasp for the first time the principles of trigonometry. By introducing the system of measuring the chord instead of the arc, he made such improvements as Mercator's projection a possibility, and gave men of scientific bent a handy tool to work with and on, instead of a cumbersome one. It was hoped that another instrument, Wallingford's 'Albion,' would be on view, but here the visitors were disappointed. Tradition had asserted that this instrument was in the possession of a local family of very long standing, acquired by their ancestor from the Abbey at the time of dissolution. Unfortunately, they had themselves been under a misapprehension about the heirloom, having confused Wallingford's Albion (an astrological instrument) with the clock that he is also recorded as having made, which was probably a large 'turret clock.' Thus they had considered a most exquisite clock in their possession as 'Wallingford's,' and thought this the Albion. Actually, the clock that was on view, though an excellent specimen, was considered by experts to be of later date, and probably not earlier than the end of the sixteenth century. If Wallingford's Albion could not be seen, the authorities of Oriel College made amends to those who had come to see it, by the loan of 'Bredon's astrolabe,' an instrument left to that society by Bredon in 1340. As Bredon was himself a pupil of Wallingford, it is by no means impossible that the astrolabe was Wallingford's work and his gift to the man who bequeathed it to its present owners.

No names are more worthy to be held in honour by all who are interested in scientific collections than those of the two Tradescants, father and son, "Both gardeners to the Rose and Lily Queen," *i.e.* Queen Henrietta Maria. The elder Tradescant it was who by the specimens of plants, animals, coins, arms and other objects of science and art accumulated by him in his travels to various parts of Europe and of northern Africa, and stored by him at his garden in West Lambeth, gave the first impulse to the formation of public museums, and so started a movement which has been of incalculable benefit to the advancement of knowledge and education. The younger Tradescant continued the work begun by his father; and, like him, travelled abroad in search of specimens to add to the collection known as "Tradescant's Ark." His visits to Virginia (1642 and 1654) resulted in the

importation of many interesting plants, amongst others, of the Commelinaceous genus named *Tradescantia* in his honour. The gift of an armorial window by the Garden Clubs of Virginia was therefore a graceful and appropriate recognition of the merits of their seventeenth-century visitor; and no more suitable position for the window could have been found than the Old Ashmolean Museum at Oxford. This building was opened in 1683 to hold the famous collection; which had been bestowed by John Tradescant the younger on his friend Elias Ashmole, and by the latter presented to the University. On November 26 the window was duly unveiled by Lord Fairfax, whose ancestor during the civil war fought on the opposite side to his friend Ashmole, and was at once the successful besieger and protector of Oxford. An inscription on the window in elegant Latin verse by Mr. J. U. Powell, of St. John's College, may be freely (and inadequately) translated as follows: "John Tradescant: Virginia's kindred spirits own his fame, and flowers in English gardens bear his name."

THREE hundred years ago, on December 10, 1626, there died the Rev. Edmund Gunter, one of the first school of English mathematicians, the friend of Briggs, Oughtred and Gellibrand, and for the last seven years of his life, professor of astronomy in Gresham College, London. Of Welsh descent, Gunter was born in Herefordshire, but was educated at Westminster and Christ Church, Oxford, taking the degree of B.A. in 1603, and that of M.A. in 1606. He entered the Church, and from 1615 onwards held the living of St. George's, Southwark. To the astronomer he is known for his invention of a portable quadrant; to the mathematician, for his *Canon Triangulorum*, the first printed table of artificial sines and tangents; to the physicist, for his discovery of the alteration in the variation of the compass; and to the surveyor, for the invention of the 'Gunter's chain,' which is 22 yards long with 100 links, an instrument which superseded the old measuring rods for land surveying and has remained in use until the present time. During the latter part of his life he had chambers in Gresham College, Sir Thomas Gresham's famous old mansion in Bishopsgate Street, where forty years later the Royal Society held its first meetings. He died in the College, and was buried, like his contemporaries Gellibrand and Foster, in St. Peter le Poor, a city church which has long since vanished.

SIR ISAAC NEWTON died on March 20, 1727, so that Sunday, March 20, 1927, will be the two-hundredth anniversary of his death. A meeting to celebrate this bicentenary will be held under the auspices of the Yorkshire Branch of the Mathematical Association at Grantham, near which Newton was born, and in which he went to school. The programme includes a scientific meeting on Saturday morning, March 19, to be addressed by Sir J. J. Thomson, Master of Trinity College, Cambridge; Sir Frank Dyson, Astronomer Royal; Dr. J. H. Jeans, Prof. G. H. Hardy, and Dr. Horace Lamb; who will speak about

Newton's work in physics, astronomy, mathematics, and mechanics. On the same day there will be a pilgrimage to the house at Woolsthorpe where Newton was born, and a visit to Stoke Rochford. In the evening there will be a dinner at the George Hotel, Grantham, among the speakers at which will be Prof. E. T. Whittaker, Prof. H. H. Turner, and other distinguished men of science. A bicentenary sermon will be preached at the Parish Church, Grantham, on Sunday, March 20, by the Bishop of Birmingham. Detailed programmes will be issued in due course. Any one interested and desiring to take part in the meeting should write to Mr. A. B. Oldfield, Rydal Villas, Crawshaw Avenue, Pudsey, near Leeds, or to Prof. S. Brodetsky, The University, Leeds. As the accommodation is very limited, application should be made as early as possible.

THE British Science Guild recently instituted an annual lecture in commemoration of its founder, Sir Norman Lockyer, and the second of the series was delivered at the Goldsmiths' Hall on November 22 by Prof. Julian Huxley, who took as his subject "Biology and Human Life." The lecture, which was delivered in the afternoon, attracted a crowded audience. Prof. Huxley prefaced his sketch of some industrial and social applications of biology by a reminder that such applications do not constitute the primary motive of research in pure science, but must be regarded as a fortunate by-product of the thirst for new knowledge. After describing some of the more recent contributions of biology to the prevention of disease and to the art of healthy living, and some of its applications to the extirpation of agricultural pests, Prof. Huxley made a strong plea for the fearless application of biological knowledge to human population problems. The relative rates of increase of the more and the less desirable groups within the species is so unfavourable to the former that every one acquainted with the facts must agree as to the disastrous consequences of permitting prejudice to obstruct practicable eugenic reforms. Such lectures do a valuable service to the community in bringing home to the educated layman the gravity of the issues at stake.

THE Council of the Royal Anthropological Institute has decided that two Rivers Memorial Medals shall be granted for the year 1926. Of these one has been awarded to Prof. Edward Westermarck in recognition of his researches on the customs and beliefs of the natives of Morocco. The other has been awarded to Dr. Alfred P. Maudslay in recognition of his work of archaeological exploration in Central America, which laid the foundations of our knowledge of the art and culture of the early inhabitants of that region and provided the nucleus of the collections of Central American antiquities, small but in certain respects unrivalled, which are exhibited in our national museums. The Rivers Medal was founded in memory of the late Dr. W. H. R. Rivers, who was president of the Royal Anthropological Institute at the time of his death, and is awarded for specially meritorious anthropological work in the field.

THE new coal-treatment laboratory of the Mining Department of the University of Birmingham was opened on November 25 by Lord Chelmsford, chairman of the Central Committee of the Miners' Welfare Fund (which has contributed 9400*l.* to the cost). In this laboratory the whole subject of cleaning and grading of coal will be dealt with; but the main problem, the solution of which is to be sought, is the economic use of very small coal (of size  $\frac{3}{8}$  inch and less). The plant consists of screening devices, capable of dealing with twelve tons per hour, together with washing and pneumatic separating machines for separating the coal from shale and other dirt. There are also crushing and briquetting plants for producing pulverised fuel and briquettes. A furnace, in which pulverised fuel is used for raising steam, is fitted with means for studying the processes and products of combustion (serving in effect as a large-scale calorimeter for pulverised fuel). There is, in addition, a special laboratory for the testing and analysis of the coal. The establishment of this coal-treatment laboratory is an important step in the application of scientific methods to the reduction of waste in the utilisation of coal.

It will be noted with regret that Prof. Garstang's resignation of the directorship of the Department of Antiquities at Jerusalem has been accepted by the High Commissioner. According to an announcement which appeared in the *Times* of November 29, the resignation will take effect in December. As head of the British School of Archaeology in Palestine and director of the Department of Antiquities during the last seven years, Prof. Garstang has done a valuable work in placing archaeological studies in Palestine on a satisfactory footing. He was largely responsible for the formation of the Department of which he was the first director; he drafted the model Antiquities Ordinance, and organised the national and local museums. Prof. Garstang will now return to the University of Liverpool, of which he is Rankine professor of archaeology.

At a meeting of the Newcomen Society held at the Science Museum on November 24, Mr. J. W. Hull was elected president in succession to Mr. Rhys Jenkins. The annual report was read, and showed a satisfactory increase in membership, the Society claiming more than sixty members in America, where considerable interest is being taken in engineering history. After the passing of the report, a paper was read on "High-Pressure Steam and the Work of the Perkins Family." Jacob Perkins, the founder of the well-known London firm, came from Massachusetts about a century ago. He made improvements in engraving machines for bank notes, etc., but is principally known as a pioneer in the use of steam at very high pressures and of compound engines, and as the original inventor of the Uniflow engine, a type which has become popular during recent years. His work was carried on by his son Angier March Perkins, and grandson Loftus Perkins, and it was the latter who, forty-five years ago, fitted the little yacht *Anthracite* with triple expansion engines sup-

plied with steam at 350 lb. pressure, and drove her across the Atlantic.

THE twenty-fourth annual meeting of the Imperial Cancer Research Fund was held on November 23, the Duke of Bedford presiding. The yearly report showed a satisfactory financial position and gave an account of sound progress in the scientific work both in the laboratories at Queen Square, London, and at the farm at Mill Hill. The investigations in hand arise mostly either from the discovery of Yamagiwa and Ichikawa that cancer can be easily produced experimentally by tar, or from the analysis by Gye of the factors concerned in its propagation. Under the former heading Dr. Cramer has shown that the systemic disturbance accompanying the absorption of autolysed normal tissues favours a cancerous response to irritation. In the second field Dr. Beggs has worked extensively with the Rous sarcoma and another fowl tumour and has obtained results which are, on the whole, concordant with Gye's experiments. Dr. Findlay is engaged with the inoculable warts of man and the dog and the somewhat similar growths of fowl-pox and pigeon-pox. Taking the work all round, it is evident that the Fund continues to consolidate our knowledge of the nature of cancer, and that the admirable foundation of good work laid by Dr. E. F. Bashford is being carried on in the same tradition by Dr. J. A. Murray. One suspects that the relatively small size of the organisation has had a good deal to do with its success: it admits of a degree of co-operation which would be impossible in a larger establishment.

THE paper on rural electrification in Sweden read to the Institution of Electrical Engineers on November 18 was both interesting and instructive. The population of Sweden which earns its livelihood by industry is now at least three times greater than it was in 1920. One reason for this is the rapid development of technical engineering. Smiths and wood carvers, having experienced the benefits which accrue from electric power, have extended their small handicraft workshops into prosperous factories employing many workmen. The agricultural industry has failed to attract the best man power. This has had grave financial consequences. Cheap electrical power is now almost a necessity in the rural districts. An attempt was recently made to connect all the important hydro-electric stations in Sweden into a State-controlled system. Dr. Ekstrom stated that he is glad that this scheme never materialised. At present the northern area is being developed under a State scheme, whilst the southern portion of Sweden is in the hands of a private company. The large power stations are all planned for ultimate inter-connexion by means of 220,000 volt mains. At present the southern company transmits from its power stations at 50,000 volts. This is stepped down to 20,000 volts for country lines and to 6000 volts for town supplies. By means of a 50,000 volt submarine cable across the Sound, the company also co-operates with Copenhagen in supplying electric power in Denmark. The importance of standardising

the systems of wiring used on farms and the necessity of only using good insulating material were insisted on. Electric cooking is popular, and attempts are being made to standardise the sizes of the electric motors used in farming operations.

It was appropriate that the first annual Malcolm Morris Memorial Lecture, which was delivered by Prof. H. J. Fleure in the hall of the Royal Society of Medicine on November 15, should have dealt with racial characters of the human skin and racial types in relation to disease, in view of the interest of that great physician in health problems connected with the skin. Prof. Fleure pointed out the importance of the investigation by both medical men and anthropologists of the diversities of human skin, and suggested that it might give clues to many other racial characters as well as to health problems. In dealing with his own thesis, Prof. Fleure sought to show in an ably developed argument that, while the fact that physiological efficiency is greatest under cool temperate conditions suggested that modern types of man originated in a zone with that type of climate, dispersions from this zone toward the southern desert fringe of Africa or the cold northern areas have brought about variations of skin character in pigmentation and growth of hair, and vascularity—specialisations affecting heat loss. The high metabolism and the fair skin of northern Europeans limit the possibilities of their adaptation to tropical climates. In the cold plateau of central Asia, man developed specialisations to meet the long period of severe dry cold. America received the bulk of its aboriginal population in drafts from north-east Asia. Consequently the American Indians have the modifications of the type of skin which were developed in central Asia. Bates noted that the Amazonians were ill adapted to the conditions of steamy heat in which they lived.

At the fifth annual general meeting of the fellows of the National Institute of Agricultural Botany at Cambridge on November 25, the chairman of the Council, Mr. W. Hasler, presented the seventh annual report and accounts. Papers were read by Dr. E. S. Beaven and Mr. F. L. Engledow. Dr. Beaven, speaking on "Field Trials of Cereals," stated that operations have been extended to field trials of varieties already in cultivation. The merits of the many 'new' varieties of cereals cannot be adequately tested by individual growers. The difference in value between two races of the same cereal, taking both yield and quality into account, often amounts to more than 20 per cent. One per cent. only added to the value of the cereal crops of Great Britain is equal to more than half a million of money per annum, and the cost of field trials is a negligible fraction of this amount. It is comparatively easy to sort out the distinctly inferior varieties. A variety which gives both low yield and inferior quality compared with others at four widely separated stations in two successive years is set down as of less than average value; if nothing more than this resulted from the trials they would be justified. Mr. F. L. Engledow spoke on "The Problem of the Adaptation of Varieties." He said that a great

advance would attend the elimination of the worst varieties and the concentration of the best in localities most suited to them. The Institute's trials now offer a means of identifying the worst and the best; progress is, however, only possible when the best varieties only are grown. Quality helps to determine monetary value per acre and constitutes a separate problem of adaptation. English wheats are used for bread, biscuits, poultry, pudding and cake flours, and prepared breakfast foods. The exact adaptation of the separate varieties to those several purposes needs more careful study.

DR. F. A. PICKWORTH has been appointed to succeed the late Sir Frederick Mott as honorary director of the Joint Board of Research for Mental Disease, Birmingham. Dr. Pickworth was laboratory director at the Hollymoor Mental Institution under Sir Frederick, and has also had experience in research in biochemistry.

MR. NEVILLE CHAMBERLAIN, Minister of Health, will preside at the re-opening on December 8 at 3.15 P.M. of the Wellcome Bureau of Scientific Research and the Museum of Medical Science at 25-28 Endsleigh Gardens, London, W.C.1. Sir Walter Fletcher, Secretary of the Medical Research Council, will deliver an address on "Research and Citizenship" after the opening ceremony has been performed, and the Bureau and Museum will then be open for inspection.

At the annual general meeting of the Royal Geological Society of Cornwall at Penzance, held on November 25, the William Bolitho Gold Medal was presented to Dr. R. H. Rastall for his researches in the geology of ore deposits. The presentation was made by Mr. J. C. Williams, Lord-Lieutenant of Cornwall, who is president of the Society for the period 1926-28. Among the papers read at the meeting was one by Dr. Rastall on "The Zonary Structure of the Earth." The retiring president, Mr. F. J. Stephens, gave an address on the geotectonics of Cornwall.

THE Philadelphia meeting of the American Association for the Advancement of Science will be held on December 27-January 1. This will be the fifth occasion when the Association has met in Philadelphia. Meetings will be held in the University of Pennsylvania, and a general science exhibition is being arranged in the Weightman Hall, which is the gymnasium of the University. Reduced passenger rates will be available from all parts of the United States and from the eastern parts of Canada. The general chairman of the local committee for the meeting is Dr. C. E. McClung, Zoological Buildings, University of Pennsylvania, Philadelphia.

THE annual report of the Raffles Museum, Singapore, for 1925, by the director, C. Boden Kloss, reports satisfactory progress and an increased number of visitors. The accessions include a Malayan cow elephant, an example of the squirrel *Glyphotes simus* Thomas, hitherto known only from the type-specimen, and the rare flying squirrel *Petinomys vordermanni*. Eighteen papers on material in the

Museum were published, and there is a list of 28 specialists co-operating in this work.

THE Ministry of Agriculture and Fisheries has published a leaflet (No. 149) on bacillary white diarrhoea of chicks. The disease, which is caused by a micro-organism *Bacillus pullorum*, is essentially one of artificial incubation and may cause considerable mortality within a few days of hatching. Full particulars are given respecting the disease and its prevention. The Ministry is prepared to undertake post-mortem examinations and agglutination tests for moderate fees if the carcass or a specimen of blood is sent to its laboratory, New Haw, Weybridge.

THE Survey of India has published its General Report and its Report on Map Publication and Office Work for 1924-25. A summary of the progress of topographical surveys shows that 44,317 square miles were surveyed during the year, leaving a balance of about one million square miles still to be done. About half of this balance will probably be surveyed on the half-inch or smaller scales. Of the modern topographical maps of India, about one-third each of the total number of one-inch and half-inch sheets are now published. Practically the whole of India, much of Burma, and most of Baluchistan, Afghanistan, and Persia are now completed on the scale of 1 to 1,000,000. In the International Map on the one million scale good progress is being made. The output of general and special maps for various purposes was considerable. The Map Publication Report contains index sheets for the various issues.

THE International Health Board of the Rockefeller Foundation has recently issued its annual report for 1925. Assistance was given to public health enterprises of various types in ninety-seven States and countries. It participated in infection and sanitation surveys, operations for the control of yellow fever, hookworm disease, and malaria, county and rural health work, the development of special divisions of public health services, and the establishment and maintenance of schools and institutions of hygiene and public health. It also provided 197 fellowships for training in public health, and contributed funds to the Health Section of the League of Nations. The report contains illustrated articles on the campaigns against hookworm disease, malaria, and yellow fever, and on other subjects. The expenditure for the year amounted to about 630,000*l.*

WE have received from Messrs. Ogilvy and Co. (20 Mortimer Street, W.1) the second edition of their catalogue of microscopical illuminating apparatus. Many types of lamps are listed, ranging from a simple electric lamp with shade for ordinary laboratory routine work to an elaborate research model, and a quartz mercury vapour lamp illuminator on a new principle, not exhausted of air, both of which are expensive items. Several ingenious and new illuminators are included.

APPLICATIONS are invited for the following appointments, on or before the dates mentioned:—A senior chemist under the Northern Coke Research Committee at Armstrong College—Prof. H. V. A.

Briscoe, Armstrong College, Newcastle-upon-Tyne (December 6). A full-time secretary of the Institute of Physics—The President, Institute of Physics, c/o Royal Institution, Albemarle Street, W.1 (December 14). A junior assistant in the engineering department of the National Physical Laboratory—The Director, National Physical Laboratory, Teddington (December 15). A live-stock officer and 7 assistant inspectors under the Ministry of Agriculture and Fisheries—The Secretary, Ministry of Agriculture and Fisheries, 10 Whitehall Place, S.W.1 (December 20). A professor of pathology and a professor of bacteriology in the University of Cairo—Sir H. J. Waring, 37 Wimpole Street, W.1 (December 23). A physicist to the Dominion Laboratory, Wellington, New Zealand—The High Commissioner for New Zealand, 415 Strand, W.C.2 (December 24). An organiser of agricultural education for the county of Wilts—The Clerk of the County Council, County Offices, Trowbridge (December 28). A director of tubercular research

in the University of Melbourne—The Agent-General for Victoria, Victoria House, Melbourne Place, Strand, W.C.2 (February 1). A senior lecturer in natural philosophy in the University of Melbourne—The Registrar, University of Melbourne, Melbourne, Victoria (February 14). A head of the electrical engineering department of the St. Helens Municipal Technical School—The Secretary for Education, Education Office, St. Helens. A lecturer in pharmacy and chemistry at the Portsmouth Municipal College—The Secretary, Offices for Higher Education, Municipal College, Portsmouth. An assistant dairy bacteriologist at the University of Bristol—The Registrar, The University, Bristol. An assistant instructor and lecturer in dairying at the British Dairy Institute, Reading—The Registrar, The University, Reading. A junior assistant chemist under the Directorate of Explosives Research of the Research Department, Woolwich—The Chief Superintendent, Research Department, Woolwich, S.E.18.

### Our Astronomical Column.

COMETS.—The following ephemeris for  $0^h$  of comet Comas Sola is from Mr. G. Merton's elements:

	R. A.	N. Decl.	log $r$ .	log $\Delta$ .
Dec. 7	2 <sup>h</sup> 28 <sup>m</sup> 41 <sup>s</sup>	9° 32'	0.2931	0.0351
„ 11	2 26 36	10 4	0.2909	0.0411
„ 15	2 25 17	10 41	0.2886	0.0484
„ 19	2 24 36	11 20	0.2864	0.0564

The comet crosses the meridian at about 9 P.M. at a considerable altitude.

Mr. G. Neujmin gives the following ephemeris for  $0^h$  of his comet in *B.Z.* No. 41:

	R.A.	Decl.	log $r$ .	log $\Delta$ .
Dec. 7	11 <sup>h</sup> 44 <sup>m</sup> 8 <sup>s</sup>	5° 40' N.	0.159	0.078
„ 11	11 56.5	3 48		
„ 15	12 8.2	1 53 N.	0.141	0.056
„ 19	12 19.8	0 4 S.		
„ 23	12 31.4	2 3 S.	0.135	0.017

Prof. G. van Biesbroeck, assisted by Mr. O. Struve, has made a fine series of cometary observations at the Yerkes Observatory. Comets Orkisz, Borrelly, Faye, and van Biesbroeck were all observed for several months in 1926. The prolonged observation of Orkisz will settle the question of its deviation from a parabolic orbit (*Astr. Jour.*, No. 872).

SPIRAL NEBULÆ.—Dr. G. E. Hale contributes an interesting article to the September number of *Scribner's Magazine*, entitled "Beyond the Milky Way," in which the character of spiral nebulae is discussed. The conflict between the distances of these objects suggested, on one hand by van Maanen's measurements of internal motion, and on the other by Hubble's observations of Cepheid variables, is described, but no final conclusion is drawn. The distances indicated are respectively of the order of 3000 to 30,000 light years and 1,000,000 light years. With regard to the possibility of systematic error in van Maanen's measurements, Dr. Hale says: "As van Maanen is unsurpassed in his skill in measurement, there can be no doubt of the existence of some form of displacement. It is difficult to conceive of systematic photographic or instrumental differences between the old and new plates which would always give an outward motion along the arms of a spiral, and the question remains whether the displacements can be accounted for by some other obscure source of error. As matters stand, van Maanen's conclusions as to the distance and dimensions of the spirals are radically different from those of Curtis and Hubble, and much work may be needed to clear up the dis-

crepancy." In the concluding paragraphs of the article, reference is made to the suggestion of Millikan and Jeans that the recently discovered penetrating cosmic rays may originate in spiral nebulae.

SOLAR RADIATION AND WEATHER FORECASTING.—An article bearing this title is contributed by C. F. Marvin and H. H. Kimball, of the U.S. Weather Bureau, in the September number of the *Journal of the Franklin Institute*. Methods of observing the solar constant are first given, and the various forms of pyrheliometers are described, including the pyranometer, an instrument developed by the Smithsonian Institution in 1920, which, in combination with the bolometer, has proved most successful. The observed values of the solar constant are then discussed, especially from the point of view of the probable errors of observation. Two graphs are given to show that the probable variation of the determinations has decreased from  $\pm 1.3$  per cent. (earliest efforts  $\pm 3.0$  per cent.) to  $\pm 0.5$  per cent. after the introduction of the pyranometer. From the nature of the scatter of Calama observations, it is concluded that it is impossible to determine whether solar variability, atmospheric variability, or errors of observing are the predominating cause, in fact that "such solar variability as exists is submerged in the errors of determination." As regards forecasting, the important question is whether an apparent fluctuation in the sun's total thermal energy of less than 0.5 per cent. can constitute a scientific basis for short- or long-range weather forecasting. The authors give their reasons for believing that the weight assignable to solar variability as a factor in the making of the weather is almost vanishingly small. H. H. Clayton's forecasts made with the help of solar constant values do not, they claim, show a marked increase in prevision in the forecasting of temperatures for New York, as compared with those made at the Weather Bureau from a superficial examination of weather maps alone. While at variance with the conclusions drawn by Dr. Abbot from the Smithsonian observations, the authors comment upon the great importance of his contributions to the subject of solar radiation and atmospheric absorption.

It may be recalled that a recent paper of Dr. Abbot's, dealing with the observations of the solar constant and their correlation with sunspot data, appeared in the *Monthly Weather Review* for May 1926 (see also *NATURE*, August 21, p. 280).