

To illustrate the process, however, here are three quotations from representative men of science, covering the period from Newton to the present time and separated by roughly equal intervals. The first is from Newton himself (1687): "I frame no hypotheses. For whatever is not deduc'd from the phenomena, is to be called an hypothesis; and hypotheses, whether metaphysical or physical, whether of occult qualities or mechanical, have no place in experimental philosophy." The second is from Laplace (1796): "I will suggest an hypothesis which appears to me to result with a great degree of probability, from the preceding phenomena, which, however, I present with that diffidence, which ought always to attach to whatever is not the result of observation and computation". The third is from Eddington (1926): "Care is taken to provide 'macroscopic' equations for the human scale of appreciation of phenomena as well as 'microscopic' equations for the microbe. But there is a difference in the attitude of the physicist towards these results; for him the macroscopic equations—the large-scale results—are just useful tools for scientific and practical progress; the microscopic view contains the real truth as to what is actually occurring." The direction of development is obvious, and its validity is the most vital question, both for the philosophy of science and for the application of scientific ideas to other departments of thought, at the present time.

The introduction of the atomic hypothesis into physics raises the question of the significance to be ascribed to hypotheses which postulate entities (such as atoms and electrons) which are essentially unobservable. I think the conclusion is inescapable that such entities can be regarded only as concepts, possessing no properties and subject to no laws other than those which are necessary and sufficient to enable them to correlate observations. The question whether they are *real* or not is already answered in the designation of them, for we can scarcely regard anything as real, in the sense in which observed existences are real, which is essentially unobservable. If we adopt such hypotheses, therefore, we have perfect freedom to shape them as we please, provided they achieve the end for which they were created. We are not bound to give them the characteristics of phenomena. They are employed for rational correlation and are not admissible to experience; they must therefore have rational properties, but not necessarily sensible ones.

This, however, was overlooked by the physicists of the early twentieth century, who appeared to be faced by an irresolvable dilemma in the inability

of the atom to emit radiation without self-destruction. The position was that either the solar system model of the atom, to which the development of the atomic hypothesis had apparently inevitably led, or the laws of electro-magnetism, abstracted from phenomena, had to be left out of consideration if the atomic hypothesis was to be extended to include the interaction of matter with radiation; and physicists in general were willing to abandon neither. Why was this?

It was simply that they did not realise the essential character of a hypothesis. The atoms, being hypothetical units, were in their hands to mould to the dictates of their imaginations, and they did not know their own freedom. They thought of atoms, not as hypotheses but as potential phenomena and therefore necessarily subject to the laws already established for phenomena by the method of abstraction. The process began when atoms were first introduced into physics. At that time they were supplied instinctively with mass and the other Newtonian abstracted qualities, and the implication that they were potential phenomena took such hold of succeeding physicists that by the twentieth century its arbitrariness needed a genius to perceive it. Fortunately the genius, in the person of Neils Bohr, was at hand. Bohr retained the solar system model of the atom, but absolved it from obedience to the laws of electro-magnetism.

This step of Bohr's was the most significant in physical science since the introduction of the hypothesis of atoms. What virtually it did was to establish the fact that the hypothetical atoms were pure conceptions: that they belonged essentially to a different category from the facts of observation. They were creatures of the imagination, to be formed into the image of our fancies and restricted by whatever laws we cared to prescribe, provided only that when they behaved in accordance with those laws they should reproduce phenomena. They were removed from the realm of experience and deposited in that of reason.

Developments have succeeded one another with almost alarming rapidity, but from the fundamental point of view nothing new has happened. The solar system model has gone and a conception devoid of any pictorial aspect has taken its place, but that—if in so speaking we may disclaim any disrespect to the brilliant physicists who have organised the process—is but the ass's kick at the dead lion. Whatever formal doctrine physicists may profess, they exhibit in practice no more belief in the phenomenal reality of atoms than in the philosopher's stone.

News and Views.

THE Duddell Medal for 1930 of the Physical Society was presented to Sir Ambrose Fleming at the annual general meeting of the Society on Mar. 20. The medal is awarded not more frequently than once a year to persons who have contributed to the advancement of knowledge by the invention or design of scientific instruments or by the discovery of materials

used in their construction. Sir Ambrose Fleming's connexion with the Physical Society dates back to its very beginning, for he read the first paper at the inaugural meeting of the Society in March 1874. In 1879, Sir Ambrose designed a special form of resistance balance for comparing standard coils, and a special form of standard coil capable of taking up

more quickly the temperature of the water in which it was placed than the form before in use. When practical incandescent electric lighting began, and quick and accurate workshop methods of electrical measurement became necessary, he made, in 1883, the first direct reading potentiometer set to read directly current and potential in amperes and volts by means of a standard Clark or Weston cell. Sir Ambrose also designed a form of wattmeter, with which he made extensive researches on alternating current transformer efficiencies, reported to the Institution of Electrical Engineers in 1892. In this paper he first suggested the use of the term 'power factor', which at once came into everyday use.

WHEN practical wireless telegraphy first began under Marconi in 1898, no appliances were obtainable for measuring wave-lengths and frequencies. In 1904, Sir Ambrose Fleming invented his cymometer, which provided a simple instrument for this purpose, capable also of measuring decrements and small capacities and inductances, and, in conjunction with Prof. Clinton, he also devised a rotating commutator for measuring the capacity of aerial waves and Leyden jars used in wireless. In 1904, he invented his now famous two-electrode thermionic valve, which prepared the way for the subsequent improvement of the three-electrode valve which is now the master weapon of the radio-engineer. Between 1892 and 1895 he carried out, in conjunction with the late Sir James Dewar, extensive researches on the electric and magnetic properties of matter at low temperatures, and devised for this purpose special forms of resistance coil, condenser, and bridge and potentiometer for the measurement of resistances, inductive capacities, and thermo-electromotive force. He was the first to establish a laboratory for high frequency and radio measurements, at University College, London, where he was professor of electrical engineering for forty-two years.

THE British Science Guild has submitted to the Royal Commission on the Civil Service a memorandum upon the structure and organisation of the Civil Service, dealing with what it describes as a "national imperfection". The Guild points out that in many present-day problems confronting Government Departments the technical and scientific aspects are of paramount importance, and it is therefore essential that an officer of the 'expert' class should be given the fullest opportunity of advancing his views and opinions, if necessary, in the presence of the ultimate authority, namely, the Minister. It accordingly advocates the development of the board system as it obtains in the larger and more progressive industrial undertakings. At the same time, the Guild states that it is necessary, in order to attract men of first-rate scientific and technical ability to the Civil Service, that "steps should be taken to remove the idea that the status of the officers performing scientific and technical duties in the Civil Service is inferior to that of the administrative and clerical groups".

THE heads of the larger and more important professional, scientific, and technical departments of the

Civil Service should, the British Science Guild claims, be given the status accorded to the highest administrative officers. The Guild doubtless has in mind the fact that, whereas there are some thirty 'administrative' posts carrying a salary of £3000 per annum and a greater number with a salary of £2200, there are only some three or four posts on the professional or scientific side with a salary of as much as £2500, the remainder receiving in every case less than £2000. The Guild further maintains that the fact that an officer with administrative gifts happens to be a professional man should not in practice debar him from administrative preferment. Finally, it is urged that the time is ripe for a simplified structure for the technical services—using that term in the broadest sense—based on their essential underlying unity, namely, the discovery and application of scientific principles for the good of the community and the increased efficiency of the services administered by the State, and in this connexion, reference is made to the proposals for such a simplification which have been put forward by a Canadian Royal Commission for the assimilation to seven grades of an "unnecessarily cumbrous" structure of 203 separate professional, scientific, and technical grades.

THE Commission appointed by Congregation in March 1930, to advise the University of Oxford as to the best method of securing such library provision as shall be abreast of modern requirements, has issued its report. The report is marked "confidential"; but its principal contents are matters of common knowledge, and are now being freely discussed. The only portion of the report that directly affects the scientific interests of the University is that dealing with the present condition and future development of the Radcliffe Science Library, now housed within the precincts of the Museum. The building known as the Radcliffe Camera was the first home of the scientific and medical library provided and maintained under the bequest of Dr. John Radcliffe in the early days of the eighteenth century. In 1860, the scientific and medical books were removed, with the consent of the Radcliffe Trustees, to quarters in the recently established Museum in the Parks; here they remained until in 1901 the present building, the gift of the Drapers' Company, was completed and ready to receive them. Since 1927, the Science Library has become the property of the University; it is administered by the Bodleian Curators, the Radcliffe Trustees contributing £1500 a year towards its maintenance. The Commission reports that the present system is well adapted to the needs of workers in science, but it is considered that further accommodation for books and staff is essential. A prolongation towards Parks Road and northward along it is recommended, the extended building being roughly L-shaped.

THE British Arctic Air Route expedition in Greenland has sent a note, published in the *Times* of Mar. 18, on its plans for exploration during the coming summer. One of the aeroplanes is badly damaged and the other requires some repairs, but both will be available to relieve the party on the interior ice cap and to support

a party that is to explore the coast regions to the north of the base on Sermilik fjord. This party set out with dog teams on Mar. 14 to map the inland edge of the ice-free margin of the coast between Sermilik fjord and Kangerdlugsuak fjord. They are travelling on the edge of the ice cap and hope to explore a lofty mountainous area which the expedition sighted last year, at the head of the last-named fjord. This is approximately the region named Schweizer Land by Quervain in 1912. It contains at least one peak more than 11,000 ft. in height. The coast of this stretch of land was mapped in detail last summer. A second party is to move south from the base, mapping the coast, which is little known, for about a hundred and fifty miles. This party will travel relatively easily over the sea ice and obtain plenty of food from seals. Sermilik fjord is also to be re-surveyed. Thus the entire expedition will be in the field during the spring and summer months. Mr. H. G. Watkins, the leader, believes that if an air route over Greenland to Canada proves feasible, it will cross the east coast between Angmagssalik and Kangerdlugsuak fjord.

ON Mar. 18, the Symons Memorial Lecture was delivered before the Royal Meteorological Society by Comdr. E. C. Shankland, his subject being "Navigation from the Viking Period to the Present Day in relation to Science and Meteorology". Comdr. Shankland sketched the probable ideas which lay at the back of the Vikings' schemes for voyaging first westward, then south-westward, and finally making voyages of more than 2000 miles. The information of climatic conditions existing in the ninth century which we possess from reference to early literature provides an interesting possibility that there was an extremely dry period for several years. As without precipitation there can be no surface moisture and consequently ice, the presumption that many parts of north Europe, such as Greenland, now perennially ice-covered, were dry and open for exploration, may have induced the Vikings to venture afield to some remote places overseas. So much of the world's navigation history has been made and adventure commenced in the North Atlantic (either from the British Isles, Scandinavian, or Continental seaports), that the use of an elementary sextant to maintain the measurement of latitude by the polar star was, in Comdr. Shankland's opinion, used prior to the compass or lodestone in Europe. Cargoes carried by ships are the product of the land, and any port enjoying trading facilities and relations with the more habitable portions of the earth must be at an advantage if centrally situated. The want of local knowledge of the weather in the North Sea and Irish Sea was probably the greatest meteorological event in our history, as it contributed towards the loss of the Spanish Armada and so gave Britain the freedom of the seas. Among modern practices, the wind pressure on ships, and the utility of the barometer in gauging the lifting power of salvage pumps in salvage operations, were explained.

WITH the current issue for March, *Antiquity* enters upon the fifth year of its existence. Those who are responsible for its publication have earned congratu-

lation and deserve every support. *Antiquity* has shown that it is possible to maintain a high level of scientific interest with a style and form which will appeal to the average educated reader. In the current number, the editor takes advantage of the fact that his editorial notes are written in an oasis of southern Tunisia to discuss the possible relation of the type of dwelling of the troglodytes of the Matmata hills, twenty-seven miles south of Gabes, of which the unit is the single cave room, with the cave dwellers of palæolithic times and the megalithic temples of Malta. Mr. Crawford contributes an article on "Historical Cycles", and Prof. Elliot Smith deals with the discovery of primitive man in China. Prof. Gordon Childe reviews the results of four years' excavation at Skara Brae, Orkney, for which he inclines to a Bronze Age date. Mr. Stuart Piggott discusses the possible origin of the Uffington White horse, on the basis of an interesting comparison with the horse design of early Iron Age coinage. Mr. C. Hawkes's paper on hill-forts, based on evidence from such as have been examined, is a pregnant study of distribution, which illustrates both by its inclusions and its omissions the comments in our issue of Mar. 21, p. 429, on the need of an archaeological survey in Great Britain and co-ordination and co-operation in future research.

SINCE 1874 the State of Illinois, U.S.A., has carried on a State Laboratory of Natural History, which in 1917 became merged with the State Entomologist's Office, to form the Natural History Survey Division. Many valuable papers have been published by the workers of the Survey and their predecessors, dealing in large part with the systematic characters of different groups in the fauna of the State. But more general papers, discussing, for example, the ecology of various types of country, have also appeared frequently in the series, and it is interesting to see that so long ago as 1880, Stephen A. Forbes, the present chief of the Survey, was writing "on some interactions of organisms", on the food of birds, on insectivorous beetles, and still earlier on the crustacea eaten by fishes. Since 1876, the *Bulletin* has been published, and now the Survey publishes a 29-page pamphlet containing a "Classified List of Publications", in which the titles of all papers and reports not out of print are arranged under subject and author headings. The endeavour of the State in publishing its reports is to increase and spread the knowledge of the plant and animal life of Illinois, and, with this end in view, the Survey is prepared to distribute its papers, so far as reprints are available, to organisations and individuals willing to use them to stimulate further interest in natural history as a feature of public education. Those interested should apply for the Classified List of Publications to the Chief, State Natural History Survey, Urbana, Illinois.

THE Lane Lectures on Experimental Pharmacology and Medicine for 1927 were to have been given by Prof. Rudolf Magnus, of the University of Utrecht, but his untimely death that year prevented the fulfilment of this plan. Three of the five lectures con-

templated had, however, been completed, and these are now published under the editorship of Prof. P. J. Hanzlik in the Publications of Stanford University, California (Medical Sciences, vol. 2, No. 3: 1930). The lectures are entitled: "A Contribution to the Experimental Pathology of the Lungs", "Choline as an Intestinal Hormone", and "The Physiological 'A priori'", and deal with certain aspects of physiology in which Prof. Magnus was interested and had carried out investigations. The monograph, however, contains, in addition, a biographical note by Dr. H. H. Dale and a list of Prof. Magnus's works, compiled by Dr. A. de Kleijn, which considerably enhance its value. Prof. Magnus will be remembered chiefly for two investigations: the first, carried out at Heidelberg, showed that the smooth muscle coats of the intestine retained their vitality and many of their activities when the organ was suspended in warm oxygenated Ringer-Locke solution: the second, carried out at Utrecht and occupying the greater part of his eighteen years at this University, on the factors controlling the changes of animal posture. This work was published a few years ago in the great monograph, "Körperstellung". But the bibliography shows that his interest in pharmacological problems continued throughout, and in fact two of them formed the subject of the Lane lectures.

THE diagnostic and therapeutic uses of the applications of electricity in medicine and surgery are continually growing in value. It is only recently that any attempt has been made to rationalise the electrical apparatus used in accordance with electrical engineering standards. We consider, therefore, that the paper on the medical and surgical application of electricity read by Dr. Bernard Leggatt to various centres of the Institution of Electrical Engineers and published in the February *Journal* will prove very helpful. He considers that the great value of this branch of electricity is not generally recognised in Great Britain. In the diagnosis of disease, the combined services of the pathologist and radiologist are responsible for about 95 per cent of all positive diagnoses; hence it is surprising that on most hospital staffs these two specialists are not considered of sufficient importance to have seats on the hospital medical committee. The applications of X-rays, which present the widest field at present both for diagnosis and the treatment of specific diseases, are discussed at length. Great differences of opinion exist as to the relative value of gas and electron X-ray tubes. These differences are easily explicable, when we consider the physics of the problem. Any dangerous electrical apparatus can be installed in a hospital without supervision and operated by persons entirely ignorant of electricity, as, unlike workshops and factories, there are no Home Office regulations applicable. The best methods of producing ultra-violet radiation and of measuring its dosage are described. The use of high frequency currents to heat the tissues of the body to any desired degree is favourably commented on, and also the uses of the electrocardiograph. Some of the electrical treatments

which have been suggested and are sometimes employed are of questionable value.

THE Report on the Investigation of Atmospheric Pollution in the year ending Mar. 31, 1930, issued by the Department of Scientific and Industrial Research, is a quarto pamphlet of 74 pages and costs 4s. (London: H.M. Stationery Office). According to it, the average amount of solid matter washed out of the atmosphere by the rain, at the 70 stations where observations are made, is slightly less than last year, but at 5 of them (in Burnley, Liverpool, Newcastle-on-Tyne, Rochdale, and Rotherham) it still exceeds 760 tons per square mile per annum, while very few get less than 100 tons per square mile per annum. When there is no rain to wash it out, this matter is present in the atmosphere at the rate of 1 or 2 milligrams per cubic metre of air, and may be carried down the wind for many miles. In London and Glasgow, domestic fires account on the average for 75 per cent and industries for 25 per cent of this solid material. While in the air, it obstructs the passage of light and particularly of ultra-violet light, and the observations at Rochdale show that 29 per cent of the ultra-violet light which reaches the outskirts of the town, where the pollution is less, is lost at the centre of the town, where the pollution is greater.

A CHEMICAL library of historic interest has just been discovered in the Bodleian Library by Dr. R. T. Gunther, who has published a list of twenty-three of the books in the recent issue of the *Bodleian Quarterly Record*. The greater number of the volumes now described were given, in 1683, by various benefactors to form the nucleus of a departmental library when the Ashmolean Chemical Laboratory was opened, as described in *NATURE* for April 2, 1927. The existence of this venerable collection of books, the oldest public chemical library in Britain, had long been forgotten owing to loss and dispersal of its volumes to fill gaps in the series of Ashmolean manuscripts, with which it had nothing to do. Fortunately, the names of donors have been inscribed in several of the books, thus establishing their identity. The more important gifts came from the vice-chancellor, the dean and other members of Christ Church, from Dr. Plot, the first professor of chemistry, and from John Cross, the 'privileged' apothecary at whose premises, in the Oxford High Street, Boyle and Hooke conducted their epoch-making researches in 'pneumatics'. None of the books is recorded as having been presented by Ashmole, although he was the founder of the professorship of chemistry.

IN connexion with the total solar eclipse on Aug. 31, 1932, which will be visible in Canada and the United States of America, it is hoped to organise two tours from Great Britain. Tour 'A' will leave on or about July 22, and, after landing at Montreal, will proceed to Victoria, B.C., by the Canadian Pacific Railway. The return journey will be through North America, arriving at Boston on or about Aug. 30. All the more important observatories will be visited. Tour 'B'

will leave on or about Aug. 12, and will not be such an extensive one, but will arrive at Boston about the same time as tour 'A'. A joint attraction is the meeting of the International Astronomical Union under the presidency of Sir Frank Dyson, the Astronomer-Royal, which will be held at Harvard as soon after the eclipse as possible. Members of either tour may have their ocean tickets made available for return directly after the eclipse or after the meeting of the I.A.U. Further information may be obtained from the Assistant Secretary, Royal Astronomical Society, Burlington House, London W.1.

THE tenth anniversary of the founding of the first birth-control clinic by Dr. Marie Stopes was celebrated by a dinner at the Ritz Hotel on Mar. 17, when a distinguished company assembled to congratulate her upon the success of her campaign. Since the opening of the clinic, direct personal instruction has been given through lady doctors and midwives to more than twelve thousand cases, mostly very poor women, who have attended for advice and help. Travelling clinics have been initiated which have done valuable service in South Wales and the industrial north. It is important to remember that Dr. Marie Stopes' society exists for "constructive birth control", and that therefore it is concerned with the positive control of conception and the production of desired children as well as the prevention of childbirth by contraceptive methods. Information as to membership may be obtained from the Secretary, C.B.C., 108 Whitfield Street, London, W.1.

AN earthquake of moderate intensity was recorded at Kew Observatory at 8 h. 16 m. 38 s. G.M.T. on Mar. 18. The epicentre is estimated to have been 7340 miles away. The readings obtained at Kew, Fordham (North America), and Pasadena indicate that the epicentre of the shock was near lat. 34° S., long. 71° W., that is, near Santiago de Chili. A moderate earthquake was also recorded at Kew Observatory at 6 h. 38 m. 31 s. G.M.T. on Mar. 19. The epicentre is estimated to have been 6080 miles away, but the initial impulse was too small to give any indication of the direction.

By the will of Mr. Montague Napier, one of the pioneers of the motor-car and aeroplane engine industry, cancer research will eventually benefit to a considerable extent. After several bequests have been made, the residue of the estate is left, subject to a life interest, "for the advancement of knowledge and the benefit of mankind by research, whether in the United Kingdom or abroad, with the object of ascertaining the cause of cancer (including corresponding or allied diseases) and the means of its prevention, cure, and alleviation, in the discretion of his trustees." The amount available for charitable purposes is expected to be about £700,000.

A SPECIAL exhibition of apparatus and equipment used in geophysical surveys was opened in the Science Museum, South Kensington, on Mar. 21, and will

remain on view for a period of three months. The exhibits have been specially selected to illustrate the development of all the important methods at present employed in the location of mineral deposits by the use of sensitive physical apparatus, as well as the evolution of the instruments and apparatus used. Details of field operations and the technique of the various methods are also represented, while in addition many examples are shown of results obtained by geophysical surveys in various parts of the world. Several of these results, which are now made public for the first time, demonstrate, in a striking manner, the possibilities of geophysical methods of exploration, in revealing the characteristic features of subterranean structures and mineral deposits.

At the stated general meeting of the Royal Irish Academy held in Dublin, Dr. R. Lloyd Praeger was elected president in succession to Prof. R. A. S. Macalister. The following officers were also elected: Treasurer, Mr. F. E. Hackett; secretary and secretary to the Science Committee, Prof. J. J. Nolan; secretary to the Polite Literature and Antiquities Committee, Mr. T. P. Le Fanu; librarian, Dr. E. J. Gwynn; resident secretary, Mr. A. Farrington. New members elected included Mr. T. S. Broderick, lecturer in mathematics and statistics, Trinity College, Dublin; Prof. T. Dillon, professor of chemistry in University College, Galway; Rev. H. V. Gill, S.J., author of numerous papers on physics and geophysics; Dr. J. H. J. Poole, lecturer in physics in Trinity College, Dublin. Elections to honorary membership included Prof. Erwin Schrödinger, Berlin, distinguished for his work in theoretical physics; and Prof. Ludwig Diels, Berlin, for his eminent work in systematic botany.

A USEFUL catalogue of books in a new condition, on all branches of chemistry has just been issued by Messrs. H. K. Lewis and Co., Ltd., 136 Gower Street, W.C.1. Being carefully classified, it should be of service for reference purposes.

LIBRARIANS and others wishing to add to their store of scientific periodicals or to fill up gaps in those upon their shelves should obtain a copy of *Periodica*, New Series, No. 4, just circulated by Messrs. W. Dawson and Sons, Ltd., Cannon House, Pilgrim Street, E.C.4, in which upwards of 700 scientific serials are listed.

APPLICATIONS are invited for the following appointments, on or before the dates mentioned:—A whole-time instructor of metalwork at the Shoreditch Technical Institute—The Education Officer (T.1), County Hall, S.E.1 (April 1). An agricultural inspector under the Department of Agriculture for Scotland—The Establishment Officer, Department of Agriculture for Scotland, Queen Street, Edinburgh (April 7). A lecturer in geography at the University College of Swansea—The Registrar, University College, Singleton Park, Swansea (April 11). A science master at the Royal Naval College, Dartmouth—The Headmaster, Royal Naval College, Dartmouth (April 13). A superintendent of instruc-

tion in the principles of boot and shoe manufacture under the Northamptonshire County Council Education Committee—The Secretary for Education, County Education Offices, Northampton (April 13). A Dickinson research travelling scholar in medicine, and a Dickinson research surgery scholar at the Manchester Royal Infirmary—The Secretary to the Trustees, Royal Infirmary, Manchester (April 18). An assistant lecturer in geology at the University College of Swansea—The Registrar, University College, Singleton Park, Swansea (April 18). A lecturer in physiology in the University of Bristol—The Secretary and Acting Registrar, The University, Bristol (April 24). An assistant lecturer in education at the University College of Hull—The Registrar, University College, Hull (May 6). An assistant lecturer in geography at the University College of Hull—The Registrar, University College, Hull (May

9). A professor of chemistry in the University of Sheffield—The Registrar, The University, Sheffield (May 15). A Pilkington fellow in cancer research, an Amy Henrietta Worswick fellow for the investigation of the causes and treatment of rheumatoid arthritis, and a Knight fellow for the study of the factors concerned in the development of the symptoms of mental disturbance, in the University of Manchester—The Registrar, The University, Manchester (June 1). A temporary lecturer in educational psychology and hygiene at Goldsmiths' College—The Warden, Goldsmiths' College, New Cross, S.E.14. A research fellow at the Liverpool and District Hospital for Diseases of the Heart—The Secretary, Heart Hospital, Oxford Street, Liverpool. A junior chemist at the Rubber Research Institute of Malaya—The Secretary, London Advisory Committee, 2 Idol Lane, Eastcheap, E.C.3.

Our Astronomical Column.

Total Eclipse of the Moon.—It is several years since a total eclipse of the moon has been visible under favourable conditions in the British Isles. Advantage should therefore be taken of the occasion on April 2, though the moon's altitude will not be great. In London, the sun sets at 6.33 P.M., the first contact with the umbra having occurred 10 minutes earlier; totality begins at 7.22, and lasts for 1½ hours; the last contact with the umbra is at 9.52.

Observations of occultations of faint stars during totality can be utilised for obtaining improved values of the moon's diameter and parallax; also studies of the colours and degrees of brightness of various regions of the moon's disc enable inferences to be drawn as to the transparency of the earth's atmosphere in the regions where the moon is on the horizon. Mr. L. Richardson contributed several papers to the B.A.A. *Journal* on this subject; he showed that it is only the lower layers of the earth's atmosphere that are effective in refracting light to the central regions of the umbra.

Who discovered Jupiter's Satellites?—J. H. Johnson, in the B.A.A. *Journal* for January, vindicates the claim of Simon Mayer to have discovered the four great satellites of Jupiter some days before Galileo, and to have deduced better values of their distances from Jupiter and their periods than those of Galileo. He gives long quotations from the original documents, and refers to J. Bosscha's paper in *Archives Néerlandaises des Sciences*, 1907. Galileo himself denounced Mayer; but his attacks appear to have been unjust, and a good deal of evidence is given in the paper that Mayer's work was independent. His values for the diameter of Jupiter and the radii of the satellite orbits suggest that his telescope gave better definition than Galileo's did. He received two excellent lenses made by John Baptist Lenccius, of Venice, early in 1610; but he had observed the satellites with another telescope in December 1609. In explanation of the fact that neither he nor Galileo noticed satellite IV. on Jan. 8, 1610, it is pointed out that it was then at elongation, far outside the other satellites, and that there were other stars of similar brightness near it. Mayer was the first to publish tables of the satellites. Bakhuyzen has shown that a fixed star which Mayer inserted in a sketch taken on Dec. 30, 1610, is in the right place; this adds weight to the genuineness of

Mayer's observations. Most modern works continue to give Galileo's name as the sole discoverer, so it is well to direct attention to Mayer's claims.

Eros.—Signor L. Jacchia, of Bologna, discusses the light-variation of Eros in *Astr. Nach.*, 5761. He finds for the period of variation 0.10973 days; most observers consider that the true period is twice as long, being formed of two waves that are similar to each other but not quite identical. The magnitude at minimum changed from 12.04 on Oct. 27 to 10.96 on Nov. 23. The amplitude of the light-variation is given as 1.12 magnitude on Oct. 22; 1.08 magnitude on Nov. 12; 1.26 on Nov. 23.

Report of the Naval Observatory, Washington, for 1930.—Details are given concerning the sending and reception of wireless time-signals. The maximum error of the Annapolis signal was 0.21 sec., the average error 0.038 sec. The signals from Rugby and Bordeaux were received on most days.

The Nautical Almanac for 1933 is practically completed. The list of stars with ephemerides has been increased by 36. A new star catalogue is being formed from 72,330 observations made with the 9-inch transit circle between 1913 and 1926. A table comparing the mean declinations of fundamental stars in different zones with those in various standard catalogues is given in the report. The 26-inch equatorial was used for observing the satellites of Jupiter and Saturn, also comets, minor planets, and occultations of stars by the moon. Photography of the sun was continued; photographs were secured on 308 days, which is a record number. The connexion of sunspots with magnetic disturbances and radio transmission is being investigated. Predictions of magnetic storms have been occasionally issued by post card. An expedition was sent from the observatory to Honey Lake, Calif., for the eclipse of April 28, 1930. The corona could not be photographed; but the position of the central line was fixed, and found to be very close to the predicted one. A collection of 625 books belonging to Prof. Asaph Hall, jun., was presented by his widow to the observatory.

Visitors are admitted to the observatory on Thursday evenings; 2824 visitors came during 1930 and they were shown objects of interest with the 12-inch equatorial.