

### Current Topics and Events.

ON Saturday last, May 9, the British Empire Exhibition at Wembley was reopened by the King amid scenes of much popular enthusiasm. The King was accompanied by the Queen and was received by the Duke of York, who is president this year of the Exhibition. In his address inviting the King to open the Exhibition, the Duke of York emphasised the many benefits which have resulted from last year's display and stated that, while the Exhibition of 1925 "has integrally the same purpose as in 1924—to show how great are the resources available within the Empire . . . it will present its lessons of Empire in a new manner." In a happy phrase, he referred to the Exhibition as the "University of Empire." The King congratulated the president, the board of management, and the executive council of the Exhibition on the results of last year's work, and again the educational side was brought out when the King, speaking of the importance of goodwill between the peoples of the British Empire, declared that "the one sure foundation for that goodwill is a full knowledge of our mutual aspirations, capacities, and needs. To seek knowledge, more knowledge, and again more knowledge, of the great heritage which has been entrusted to us is the soundest Imperial policy." As last year, the opening ceremony in the Stadium was broadcast from all the stations of the British Broadcasting Company. The general features of the Exhibition will be familiar to most readers of NATURE, and we hope in future issues to deal in detail with specific scientific aspects such as the display illustrating physical and biological science arranged by the Royal Society, the pure chemistry section which the Association of British Manufacturers has organised, and so on.

THE Salters' Institute of Industrial Chemistry, which was founded by the Salters' Company to further the interests of industries with which it is historically connected, has now been in existence for seven years, and during this time, under the successive directorships of Dr. M. O. Forster and Prof. Arthur Smithells, it has been very successful in assisting the education of those destined for the career of industrial chemistry. For the first few years of its existence, the Institute devoted itself to helping students whose chemical training had been interrupted by the War; now it is following the policy originally laid down, namely, of awarding fellowships, of the normal value of 250-300*l.* per annum, to those who have obtained an honours degree at a university, or the equivalent, and have had a little experience of research; and of giving grants-in-aid to young men or women employed in chemical works for the purpose of continuing their chemical studies. It is interesting to note that in the award of fellowships, academic distinctions and purely mental attainments are not taken as the sole criteria of eligibility. Those conversant with the conditions in industrial works know well how often the academic man fails either because he has little or no power of applying his knowledge, or because he lacks the ability to co-operate with

those whose mental or social level is different from his own; and we wish the Salters' Institute every success in its endeavour to supply the chemical industry with men of character as well as of intellectual attainment.

THE Bolshevik commercial publication in England, the *Soviet Union Review*, in its number for April 25, has published a formidable list of scientific institutions, learned societies, museums, etc., in the R.S.F.S.R., which means the Russian Soviet Federation of Socialist Republics, and is the overwhelmingly dominant partner in what is known as the S.S.S.R., the Soyuz (Union) of Soviet Social Republics, which in turn corresponds to what we have always known as the Russian Empire, though shorn of Finland, the Baltic States, its Polish provinces, and Bessarabia. The catalogue includes 21 institutions connected with the Academy of Sciences in Leningrad, 15 physico-mathematical institutions, 12 physico-scientific, 6 biological stations, 7 physico-historical and mathematical research institutes, 4 concerned with political economy and culture research, 4 with scientific research pedagogic institutes, 6 for social study, 11 scientific libraries, 6 scientific societies in Moscow, 9 in Leningrad and 13 in the provinces, 25 regional societies, a substantial catalogue of museums and 6 State Nature preserves. The object is evidently to show the work the Bolsheviks are doing in the arts and sciences, and a certain amount of credit must be granted to Lunacharsky, Commissar of Education, for his protection. But the vast majority of these institutions existed in tsarist days; only their titles have been altered. Novelties are the institutes for the promotion of Bolshevism, such as the Institute of Red Professors in Moscow, the chair for the study of Marxism at Kazan, and the Marxist Society in Leningrad. The museums have been enormously enriched in material and multiplied in number by the confiscation of private collections and conversion of aristocratic palaces into museums. But the article throws no light upon the efficiency of these institutions. It is known that the serious workers are hampered by incessant interference, and the financial grants, generous enough on paper, are ludicrously inadequate in fact. Thus, a grant of 130,000 gold roubles for the maintenance of one of the big scientific institutions was made and properly confirmed, but of this only 3000 roubles reached the treasurer, so that it exists to-day entirely upon the very high admission fees, which the workers of the proletariat have to pay if they want to see the museums. Truly, in Russia, "the man who holds the honey-pot licks his fingers," as the Turks say.

ARRANGEMENTS have been made by the American National Geographic Society, in co-operation with the Smithsonian Institution of Washington, to establish a station at some convenient spot for the purpose of making daily observations of the solar constant of radiation over a period of four years. An expedition, of which Dr. C. G. Abbot (director of the Astrophysical Observatory of the Smithsonian Institution)

will be the leader, will be sent out to the station chosen in order to make the necessary observations. Sites in Baluchistan, South-west Africa, and Morocco have already been selected for inspection. The project has arisen as the result of certain conclusions drawn by Dr. Abbot and his assistants—from their refined observations of the solar constant for several years past—with regard to the dependence of terrestrial weather on changes in solar radiation. It is hoped that the observations will assist in solving the problem of long-range weather forecasting. The National Geographic Society has set aside the sum of 55,000 dollars for the purpose of the expedition.

DR. ALES HRDLICKA has left Washington in charge of a survey of the field of early man and his predecessors in Southern Asia, Java, Australia, and Africa by the Smithsonian Institution in co-operation with the Buffalo Society of Natural History. The object of the expedition is to examine personally all traces of ancient man and his predecessors in these localities. In India, Dr. Hrdlicka will endeavour to examine all collections of Palæolithic implements as well as all other specimens relating to ancient man and extinct sub-human forms. He expects to visit the Siwalik Hills and also two or more of the most important centres of the non-Aryan Indian population. In Java the localities of the finds of the now known representatives of the early man *Pithecanthropus* will be visited. In Australia, Dr. Hrdlicka expects to examine the fossil Talgai skull and other skeletal remains of the Australian aborigines. In South Africa an effort will be made to visit the sites of the find of the Rhodesian man, of recent finds of fossil anthropoid apes and of prehistoric human skulls preceding the Bushman and Negro.

AN expedition under the leadership of Dr. D. B. Macmillan is leaving for the Arctic regions at the end of June under the auspices of the National Geographic Society of Washington. The first aim of the expedition will be to examine the ruins of the old Norse settlements in Greenland around Julianehaab and Godthaab, comparing these with ruins found on the coast of Labrador. It is hoped by this means to prove or disprove the Norse settlement of Labrador. From Godthaab the expedition will sail for Etah, which should be reached early in August. Here a base will be made for exploration by amphibian aeroplanes of the Greenland ice cap, Ellesmere Land and Grant Land. From Etah, oil and other supplies will be carried by air to a second base at Cape Thomas Hubbard on the north of Axel Heibergland, a distance of about two hundred and fifty miles. This base will be used for an aeroplane reconnaissance of the unexplored area of the Arctic Ocean lying between the Canadian Arctic Archipelago and the New Siberia Islands. The distance to the centre of this unknown area is about six hundred miles, and Dr. Macmillan hopes to cover the double journey in a continuous flight. If any islands are discovered, a landing will be made. On the completion of this ambitious programme in the north, the expedition will go southward along the eastern shores of Ellesmere

Land to Bylot Island, which will serve as a base for the aeroplane exploration of Baffin Land. Lastly, Nachvak Bay will serve as a base for flights over northern Labrador. Meteorological observations of the upper air will be taken during all the flights. It is expected that the expedition will be away until the autumn.

A COMMUNICATION in the *Times* of April 28 describes investigations carried out last year by Prof. Hrozny in Syria and Asia Minor with the object of throwing light on Hittite problems. Prof. Hrozny, who is well known to scholars for his researches in the Hittite language, which led to the discovery of its Indo-European affinities, has planned a series of excavations on sites on the borders of the Hittite Empire in the hope that the discovery of a bilingual inscription may lead to the decipherment of the Hittite pictographic script. Excavations at Sheik Sa'ad in Bashan near the monolith of Rameses, called by the neighbouring inhabitants "the Stone of Job," revealed an Amorite shrine of a deity Arkan Saphon, which was the centre of a widespread cult. This cult, as was shown by the later Hellenistic shrine, was adopted by the Greeks. It was surrounded by a number of edifices and remains ranging from the Hittite period in the Second Millennium B.C. down to the Roman times. It is clear that the inhabitants were Amorites who were affected by Hittite culture, and possibly under Hittite rule. The site may mark the frontier of the Hittite Empire. A projected excavation at Kaisarieh in Anatolia could not be carried out, but the hitherto unknown source of the well-known Cappadocian tablets was identified at Kul Tepe.

DR. H. H. DALE, in his discourse at the Royal Institution on May 8, on the circulation of blood in the capillary vessels, said that about the year 1917 evidence from several independent quarters began to appear, necessitating an extensive revision of the older conception of the capillaries as playing a purely passive rôle in the regulation of the blood flow. Ebbecke in Germany, and Lewis and his co-workers in Britain, began to publish evidence that the capillaries are capable of closing completely by their own contractile force. In the following year Krogh, of Copenhagen, showed that, in the muscles at rest, only a very small part of the rich network of capillary vessels is open for the passage of blood, the remainder being completely closed by their own contractile tone. Meanwhile similar conclusions had been reached by another independent group of investigators, including Dr. Dale, who were studying the collapse of the circulation produced by a group of substances resulting from the decomposition of proteins, a typical member being the base histamine. Such substances caused relaxation of the peripheral blood vessels, apparently largely of the capillaries. When the effect was intense, a large part of the blood passed out of circulation, becoming stagnant in the generally relaxed capillary vessels, and losing a large part of its plasma through their permeable walls. The deduction was made, and almost immediately

confirmed by Krogh's direct observations, that the capillaries possess a power of independent contraction, by which a large proportion of them are normally closed. These conceptions have acquired increasing importance, not only for the understanding of the fine adjustment of the blood-flow to the varying metabolic needs of the tissues, but also in explaining a number of pathological conditions, where, as the result of massive injury of the tissues, or of the invasion of the body by bacteria, poisonous protein derivatives are distributed in the circulation producing in a generalised and dangerous form a relaxation of the capillary vessels, which, in the form of a localised inflammation, is protective and restorative. There is evidence that the internal secretions of the suprarenal and pituitary glands have an important effect on the tone of the capillary vessels.

THE first Fison Memorial Lecture was delivered by Sir Joseph Thomson in the Medical School, Guy's Hospital, London, on Thursday, May 7, the chair being taken by Lord Balfour. Sir Joseph selected as his subject "The Structure of Light," in the course of which he stated that the optical properties of light appear to be explicable only upon a wave theory, whereas the electrical properties are more easily explained on a corpuscular theory. Newton himself really combined the two theories, as the assumption of waves generated by the corpuscles was an essential part of his explanation of simultaneous reflection and refraction. The followers of Newton were "more corpuscular" than Newton himself, and a purely corpuscular theory of light was generally adopted until the work of Young and Fresnel once more focussed attention upon the wave theory. By the end of the nineteenth century, Maxwell's electromagnetic theory, and the pioneer experiments of Hertz and Lodge on electromagnetic waves, had made the wave theory of light probably the most complete and satisfactory in physical science. Then the study of gaseous ionisation, the photoelectric effect, X-rays and black body radiation, began to throw doubts upon the sufficiency of the ordinary wave theory.

As an alternative, Sir Joseph Thomson put forward a new theory designed to explain both electrical and optical properties of light (see *Phil. Mag.*, vol. 48 (1924), p. 737). Imagine an electron and a positive nucleus joined by a tube of force. If the electron jumps from one stable state to another of smaller energy, we may suppose that the tube of force is thrown into a loop, which becomes detached as a closed "ring of force." Such a ring would travel out like a vortex ring in a direction perpendicular to its own plane. It would also carry with it a definite "quantum" of energy. Immediately before and after the formation of the ring ordinary electromagnetic waves would also be started, but the ring would carry nearly all the energy liberated by the movement of the electron. Absorption of energy by an atom could take place by a converse process, and would normally occur only when the energy in the ring was sufficient to move an electron from one

stable state to another, *i.e.* when the energy was great enough to produce partial or complete ionisation of the atom. The circumference of a ring of force would be equal to the wave-length of the light, and so a ring of visible light would be too large to be absorbed easily by an atom except by a process involving resonance, whereas an X-ray ring would be comparable in size to an atom. This would account for the observed differences between X-ray and optical absorption. The waves which accompany the ring would undergo interference and diffraction, and the rings would tend to follow the waves, so that the probability of a ring reaching a given point would depend upon the amplitude of the wave at that point. Thus interference and diffraction fringes would be statistical effects.

THE eighth lecture of the series on "Physics in Industry" being given under the auspices of the Institute of Physics was delivered by Dr. W. Makower on April 29 and dealt with "Physics in the Rubber Industry with special reference to Tyre Manufacture." In this industry there are many stages where the skilled assistance of the physicist has proved valuable in improving the product or in reducing costs. In testing the raw material, hardness is the decisive quality and this is determined by viscosity measurements, made by forcing the rubber at a constant temperature of 80° C. through an orifice and measuring the rate of flow. In all properties related to hardness, temperature is a most important factor. Thus, rubber must be stored at a low temperature and processes such as calendaring and rolling must be carried out at constant temperatures, to which end thermocouples are now used extensively. To measure the physical effects of addition agents on hardness, it is usual to construct stress-strain diagrams. In vulcanisation, physical control is used in determining the amount of sulphur absorbed at different depths of the tyre, thermocouples being embedded in it and the temperature attained noted. The way the tyre is built up will determine largely its ultimate strength, which is found chiefly to depend upon that of the cotton case. Other necessary tests are for fatigue and abrasion, and these have to be so designed as to imitate the effects of actual practice. Of great interest are the hysteresis heat losses, which may amount to one-half to one H.P. per tyre. These depend upon the deformation of the rubber as well as on the rate of application of the cyclical stresses. In this connexion, Dr. Makower pleaded for closer co-operation between tyre manufacturers and automobile engineers so that there may be careful adjustment between springs and tyre equipment.

BROADCASTING reception in Great Britain is by no means confined to the programmes transmitted by stations in this country, and a number of continental stations can now be easily received. The Oslo station is the most recent addition, and the number will soon be increased by transmission from Stockholm and Madrid, when the stations which are now in course of erection by Marconi's Wireless Telegraph Co., Ltd., are completed. The new stations are

Standard Marconi 6 kw. Type "Q" stations, similar to those of the British Broadcasting Company's main stations. The transmitter consists essentially of four panels; rectifier; independent drive; main oscillator and modulator. The use of the independent drive in the Marconi transmitters ensures the invariability of the carrier wave frequency, with consequent absence of alteration of tuning adjustments at the receiver. One of the features of transmissions from the Oslo station so far as British reception is concerned, appears to be the absence of fading. The aerial is supported by two lattice steel masts 70 feet high and is a "T" type of four-wire cage aerial, with a span of 150 feet. The Oslo station has avoided causing interference with other European broadcasting stations by using the wave-length of 382.5 metres.

THE twelfth International Physiological Congress will be held in 1926, at Stockholm, on August 3-6. The Congress will be under the presidency of Prof. Johansson. Prof. Liljestrand will be honorary secretary, and Prof. Santesson honorary treasurer.

THE Lawes Agricultural Trust Committee has appointed as its chairman Lord Clinton, in succession to Lord Bledisloe, who resigned on accepting the post of Parliamentary Secretary to the Ministry of Agriculture and Deputy Minister of Fisheries.

DR. EMILE BRUMPT, professor of the Faculty of Medicine of the University of Paris, will deliver two Chadwick Public Lectures, on May 25 at the Barnes Hall of the Royal Society of Medicine on "How to conduct an Anti-Malarial Campaign," and on May 29 at the Royal Society of Arts on "The Prophylaxis of Sleeping Sickness."

DR. E. F. ARMSTRONG, F.R.S., technical director of Joseph Crosfield and Sons' Soapworks at Warrington, has been appointed managing director of the British Dyestuffs Corporation. Dr. Armstrong, who was president of the Society of Chemical Industry in 1922-24, is well known for his work on the chemistry of plant products and on the nature of enzymes; he has also made noteworthy contributions to the study of catalysis. His work covers a wide field in both pure and applied chemistry, and together with his administrative experience, eminently qualify him for the important post which he has now accepted.

THE Council of the Royal Society of Edinburgh has made the following awards:—The Gunning Victoria Jubilee Prize for the period 1920-1924, to Sir Joseph Thomson, in recognition of his great discoveries in physical science; and the Makdougall-Brisbane Prize for the periods 1920-1924, to Prof. H. Stanley Allen, for his papers on the quantum and atomic theory, published in the Society's Proceedings within the periods.

THE Council of the Institution of Electrical Engineers has made the following award of premiums for papers read during the session 1924-25, or accepted for publication:—*The Institution Premium*: Mr. H. W. Clothier. *Ayrton Premium*: Major E. I. David. *Fahie Premium*: Col. T. F. Purves. *John Hopkinson Premium*: Mr. G. Rogers. *Kelvin Premium*:

Lieut.-Col. K. G. Maxwell and Mr. A. Monkhouse. *Paris Premium*: Mr. D. Murray. *Extra Premiums*: Messrs. J. D. Cockcroft, R. T. Coe, J. A. Tyacke, Prof. Miles Walker, and Mr. S. Holmes. *Wireless Premiums*: Major A. G. Lee and Mr. A. J. Gill; Capt. H. J. Round and Messrs. T. L. Eckersley, K. Tremellen, and F. C. Lunnon; Prof. E. Mallett and Mr. A. D. Blumlein; and Mr. L. C. Pocock.

PROF. T. C. CHAMBERLIN, of Chicago, has been awarded the first Penrose Medal of the American Society of Economic Geologists. The Medal, which is to be given once in three years for "exceptionally original work in the earth sciences," was established by Dr. R. A. F. Penrose, jun., first president of the Society of Economic Geologists, and is of gold. We learn from *Science* that in making the award, Prof. Kemp, president of the Society, referred in particular to Prof. Chamberlin's work on the lead and zinc ores of the Upper Mississippi Valley, and to his contributions on the Ice Age, on the planetesimal hypothesis and related topics, and on diastrophism as a principle in the subdivision of geological time.

WING COMMANDER HAROLD E. WHITTINGHAM has been awarded the Chadwick Gold Medal and 100*l.* prize for his work on sand-fly fever. The award is made under the provisions of the Chadwick Trust, whereby the Trustees may, once in every five years, present the sum of 100*l.* and a Gold Medal to be called the Chadwick Naval, Military or Air Force Prize to such officer of the Navy, Army or Air Force Medical Service as shall during the preceding five years have "specially assisted in promoting the health of the men" of the Service to which he belongs.

A CONFERENCE of women in science and industry at the British Empire Exhibition, Wembley, on July 15-17, has been convened by the Women's Engineering Society in co-operation with the British Federation of University Women, Industrial Welfare Society, Institute of Industrial Welfare Workers, The National Union of Scientific Workers, The Standing Joint Committee of Industrial Women's Organisations and the Women's Electrical Association. H.R.H. the Duchess of York has consented to become president of the conference, and amongst those speaking on the opening day will be: The Hon. Lady Parsons (Engineering), and Miss Ellen Wilkinson, M.P. (Industrial Organisation). The following two days will be devoted to papers by women workers on such subjects as engineering, chemistry, industrial welfare, factory inspection and commerce. Particulars can be obtained from the Secretary, Women's Engineering Society, 26 George Street, Hanover Square, London, W.1.

A PRELIMINARY meeting of the International Congress of Radiology will be held at the Central Hall, Westminster, on July 1-4, under the presidency of Mr. C. Thurstan Holland. The Congress will meet in three sections: (1) radiology; (2) electrotherapy and physiotherapy; and (3) physics. During the meeting there will be an exhibition of apparatus and books at the Central Hall, Westminster, and an exhibition of radiograms in the British Institute of Radiology, including those relating to papers read at the Congress.

On July 1 the Duc de Broglie will deliver the Silvanus Thompson Memorial Lecture, and on July 3 Sir Berkeley Moynihan will deliver the Mackenzie Davidson Memorial Lecture, taking as his subject "The Relationship of Radiology and Surgery." Communications regarding the Congress should be addressed to the Secretaries, International Congress of Radiology, c/o British Institute of Radiology, 32 Welbeck Street, London, W.1.

For its May meeting the Society of Glass Technology has arranged a symposium of papers on the constitution of glass, to which a number of important contributions have been promised. Two sessions will be held, the first at 7.30 P.M. on Monday, May 25, at the Royal Society of Arts, John Street, Adelphi, London, and the second on Tuesday, May 26, at 2.30 P.M., in the Chemistry Lecture Theatre, University College, Gower Street, London. Papers have been promised by Prof. W. E. S. Turner (Sheffield), Prof. G. Tammann (Göttingen), Dr. F. Eckert (Essen), Dr. A. Q. Tool and E. E. Hill (Bureau of Standards, U.S.A.), Prof. Le H. Chatelier (Paris), Sir William Bragg (Royal Institution, London), Mr. V. H. Stott (National Physical Laboratory, Teddington), Dr. G. W. Morey and Dr. N. L. Bowen (Geophysical Laboratory, Washington), Dr. A. A. Lebedeff (Optical Institute, Leningrad), Dr. G. W. Morey and Dr. R. W. G. Wyckoff (Geophysical Laboratory, Washington). Members of the Faraday Society, the Optical Society, the Physical Society, and others interested in the subjects of discussion are invited to be present.

We welcome the appearance of the opening part of the *Japanese Journal of Mathematics*, which is

announced to appear quarterly, sponsored by the National Research Council of Japan. Ninety-three pages of Transactions contain 16 papers (of which 14 are in English and 2 in German), all in pure mathematics and nearly all on the higher analysis. There follow 12 pages of English abstracts of recent mathematical papers published in other Japanese journals. This new venture, together with similar publications already in existence or promised, covering such subjects as astronomy and geophysics, chemistry, physics, geology and geography, botany, zoology, medical science, and engineering, are likely to enhance the quality of scientific research in Japan; and if they are well distributed they cannot fail to improve the status of Japanese work in the world of science.

APPLICATIONS are invited for the following appointments, on or before the dates mentioned: an assistant in mathematics in the Queen's University, Belfast—Prof. Dixon, the University; a lecturer in agriculture at Armstrong College, Newcastle-upon-Tyne—The Registrar; a laboratory assistant in the agricultural department of the Government of Kenya—The Crown Agents for the Colonies, 4 Millbank, S.W.1; two zoologists for the *Discovery* Expedition—The Secretary, *Discovery* Committee, Colonial Office, Downing Street, S.W.1 (May 25); a junior assistant under the directorate of explosives research of the research department, Woolwich—The Chief Superintendent, Research Department, Woolwich; a biology teacher, either sex, at the Municipal Secondary School, Wolverhampton—The Director of Education, Education Offices, Wolverhampton (May 30); full-time lecturers in biology and mathematics at the Technical College, Cardiff—The Principal (May 30).

### Our Astronomical Column.

COMETS AND MINOR PLANETS.—Dr. W. H. Steavenson obtained an observation of Orkisz's Comet on May 6<sup>d</sup> 0<sup>h</sup> 1<sup>m</sup>, G.M.T. (new), R.A. 23<sup>h</sup> 15<sup>m</sup> 26.12<sup>s</sup>, N. Decl. 55° 14' 53.9", equinox 1925.0. The comet was of magnitude 7.5 and growing slightly fainter.

Owing to its high north declination it is observable all night:

EPHEMERIS FOR 0<sup>h</sup> (by Möller and Johannsen).

	R.A.	N. Decl.	log r.	log Δ.
May 15.	23 <sup>h</sup> 51 <sup>m</sup> 4 <sup>s</sup>	67° 25'		
19.	0 18 23	72 24	0.129	0.184
23.	1 1 31	76 51		
27.	2 14 57	80 23	0.152	0.206
31.	4 12 18	82 11		
June 4.	6 18 19	81 36	0.175	0.235

EPHEMERIS FOR 0<sup>h</sup> OF COMET SCHAIN, COMAS SOLA (by H. Kobold).

	R.A.	N. Decl.	log Δ.
May 16.	10 <sup>h</sup> 31 <sup>m</sup> 45 <sup>s</sup>	4° 28'	
20.	10 28 27	4 29	0.604
24.	10 25 30	4 30	
28.	10 22 54	4 29	0.619
June 1.	10 20 36	4 26	
5.	10 18 37	4 22	0.634

It is of magnitude 12 and slowly fading.

*Astr. Nach.*, No. 5365, contains an important series of observations of planet TD (the interesting object discovered last October by Baade, the period of which is 4.36 years), made by G. Struve at Berlin Babelsberg, extending from November to March 3, when its magnitude was 13.0.

No. 5366 contains observations by J. Hartmann from April to July 1924 of the planet RK, which he discovered last year. Its period is five years and its eccentricity is very small. He has given it the name La Plata, after the town where it was discovered.

GRAVITATIONAL FORCES IN SPIRAL NEBULÆ.—Prof. Ernest Brown contributes a paper on this subject to the *Astrophysical Journal* for March. His aim is to see whether the observed motions can be explained without the assumption of non-gravitational forces such as those suggested by Dr. Jeans's investigations. He first analyses the motions given by Mr. van Maanen, and shows that these are by no means uniformly outward, though the latter direction predominates at points where the spiral arms are well defined. The angular velocities diminish rapidly at first, and then become nearly constant, indicating a force varying as the distance from the centre; this would be the law of force in the equatorial plane of an ellipsoid of uniform density for a particle within the ellipsoid. The suggestion is, therefore, that there is considerable concentration at the centre, and outside this an extended ellipsoid of low and nearly constant density. The orbits of the constituent particles are supposed to fall into groups of which the "arms" of the spiral are envelopes. The space density is of the order of  $10^{-15}$  of that of the sun; this gives masses of the order of  $10^8$  times the sun, assuming a parallax of 0.001", which is, however, much larger than that indicated by the recent researches of Hubble.