News and Views.

THE Kelvin lecture delivered before the Institution of Electrical Engineers by Dr. G. C. Simpson, Director of the Meteorological Office, which appears in a slightly abridged form as a Supplement to this issue, will be read with interest. The valuable work Dr. Simpson has done in investigating the phenomena of lightning discharge makes everything he says worth careful consideration. In one or two places, however, he makes very definite assertions which, as our knowledge increases, will almost certainly have to be modified. For example, he says that the resistivity of the lower atmosphere in clear weather is approximately $4 \cdot 5 \times 10^{15}$ ohms. The values found for ebonite and sulphur are much greater than this, and good paraffin has a volume resistivity greater than 5×10^{18}. If air has this low resistivity, the values accepted by electricians for good insulators must be very inaccurate. We know that the resistivities of many insulators vary very rapidly with temperature, but some seem to remain constant. Dr. Simpson considers that during a thunderstorm we have non-conducting clouds floating within a conducting atmosphere, thus completely reversing our ordinary ideas. That lightning flashes could occur under such conditions will be readily admitted. We know that sparks take place readily between two pith balls. We always thought that the charge collected on the surface of an ordinary insulator. In Kelvin's theory, in which he explains the anomalous actions that occur when two pith balls of like sign are brought close together, it is assumed that the electricity is on the surface. It is difficult to believe that a cloud is a perfect non-conductor.

DR. SIMPSON'S theory of how the electrical energy is generated during a thunderstorm, the so-called 'breaking-drop' theory, can be readily accepted by the engineer. It originated in Lenard's discovery that when pure water splashes against a solid obstacle electrification ensues. Dr. Simpson then discovered that when a drop of water is broken up in the air without striking anything, the same separation of the positive and negative electricities takes place. The limiting velocity of a large raindrop falling vertically is about 8 metres per second (17 miles per hour). A drop larger than about 0·5 cm. in diameter is unstable; it becomes flattened out and quickly breaks up into a number of small drops. When it breaks up it receives a positive charge. Now it is known that some of the air inside a thundercloud is moving with a vertical velocity greater than eight metres per second. The resulting negative charge is given to the air and is absorbed by the cloud particles which are being carried upwards. We would expect, therefore, that the rain which falls where the air currents are vertical would be positively charged and that at a distance from this region it would be negatively charged. This is in accordance with observation. There will be occasional discharges from the earth to the negatively charged cloud, but the most frequent discharges will be downwards towards the ground, some of them apparently ending in the air. We hope that this lecture will give an impulse to the study of the phenomena of lightning, as, notwithstanding recent advances, there are still many difficulties to be explained. The phenomena of chain lightning and globular lightning have not been considered. An explanation of these curious occurrences would probably reflect light on the mechanism of an ordinary thunderstorm.

THE Nobel prize for physics for 1928 has been awarded to Prof. O. W. Richardson, for his researches upon the emission of electricity from incandescent materials, and in particular for his investigations of the laws governing the rate of emission of electrons. Prof. Richardson is a Yarrow research professor of the Royal Society, but continues to direct the research work of a large number of students at King's College in the University of London, where he held the Wheatstone chair of physics from 1914 until 1924. Richardson virtually created the subject of thermionics, and so long ago as 1901 "showed that the negative ionisation from hot metals could be satisfactorily explained by supposing that it was caused by the freely moving corpuscles inside the metal escaping from the surface when their kinetic energy exceeded a certain value", to quote from a paper by him in the *Proceedings of the Royal Society* for 1906. His monograph on "The Emission of Electricity from Hot Bodies", which first appeared in 1916, goes almost so far as is possible without the aid of the new mechanics and the refined vacuum methods developed afterwards in connexion with technical applications of thermionics. Richardson's "Electron Theory of Matter" is also well known to students of electricity and atomic physics, and although published between the advent of the Bohr and the Wilson-Sommerfeld theories of the atom and with a strong classical bias, is still much used. Richardson has made numerous important contributions to other branches of atomic physics, the most important of which are perhaps his extensive investigations of soft X-rays by electrical methods, and his unravelling of bands from the complicated molecular spectrum of hydrogen.

THE work for which the Duc de Broglie has been awarded the Nobel prize for physics for 1929 is of more recent date, and will be familiar to most readers of NATURE. Looking back now at his earlier work on the undulatory theory of matter, it would appear that the path of approach to the idea of the material wave was primarily from the realm of optics. de Broglie's important paper in the *Philosophical Magazine* for 1924 (vol. 47, p. 446) is entitled "A Tentative Theory of Light Quanta", and it is in this that he develops the analogy between the principles of Fermat and of Maupertuis, and shows how "the Lorentz-Einstein transformation joined with the quantum relation leads us necessarily to associate motion of body and propagation of wave, and that this idea gives a physical interpretation of Bohr's analytical stability conditions". The criticism which de Broglie anticipated would be accorded to these then novel views has been constructive rather than otherwise, and it is by now an old story how his predictions have been verified by the experiments of G. P. Thomson, Rupp, Kikuchi, and others, and how his ideas have been elaborated by Schrödinger and incorporated in the present fabric of the quantum theory.

THE Nobel prize for chemistry for 1929 has been divided between Prof. Arthur Harden, head of the Biochemical Department at the Lister Institute and professor of biochemistry in the University of London, and Prof. Hans von Euler-Chelpin of Stockholm. Prof. Harden, who is also one of the editors of the *Biochemical Journal* and an original member of the Biochemical Society, is perhaps best known for his work on the alcoholic fermentation of yeast: nearly twenty years ago he published a monograph on this subject, as one of the series of Monographs on Biochemistry, which has recently reached its third edition. He is the author (with W. J. Young) of papers on the co-ferment of yeast juice and the function of phosphates in the fermentation of glucose by yeast juice: from the latter observations has developed our knowledge of the place of hexose phosphates in carbohydrate metabolism, and it is now known that these substances play an important part not only in the yeast plant but also in higher animals as well, especially in the process of glycogen synthesis and breakdown, and hence in muscular contraction. Prof. Hans von Euler-Chelpin, who is professor of chemistry in the Technical High School, Stockholm, has also made noteworthy contributions to our knowledge of the chemistry of enzymes.

ONE hundred years ago—in 1829—the Royal Society made no conferment of its Copley medal, and doubtless at the time there was adequate reason. Originally, the small sum attaching to Sir Godfrey Copley's legacy was devoted to experiments for the Society's own advantage, but on Nov. 10, 1736, "Mr. Folkes proposed a Thought to render Sir Godfrey Copley's Donation for an Annual Experiment more beneficial than it is at present, which was to convert the value of it into a Medal, or other honorary prize, to be bestowed on the person whose experiment should be best approved: by which means he apprehended a laudable emulation might be excited among men of genius". The idea met with approval, and on Dec. 7 following, the president and council resolved "that instead of Sir Godfrey Copley's Annual Donation of Five Pounds, a Gold Medal should be struck of the same value, with the Arms of the Society impressed on it, and that the same should be given as a voluntary reward, or honorary favour, for the best Experiment produced within the year, and bestowed in such a manner as to avoid envy or disgust in rivalship". In 1756 the experiment provision was repealed, and there are now no time limitations, nor is the nationality of the recipient incidental to award. In 1766 triple awards of the medal were made, these respectively to William Brownrigg, Edward Delaval, and the Hon. Henry Cavendish. In 1840, Liebig and Sturm each received a medal, but since that date a single yearly allotment has been the rule.

As regards the two Royal medals, no intermittance occurred in 1829; the recipients were Charles Bell, and Eilhard Mitscherlich, of Berlin. The grounds of award for the former were "his Discoveries relating to the Nervous System"; for the latter, "his Discoveries relating to the Laws of Crystallization and the Properties of Crystals". Sir Charles Bell (he was knighted by William IV.) was born at Edinburgh in 1774. In early manhood he was already an anatomist of repute, and a convincing lecturer. His essay, "A New Idea of the Anatomy of the Brain" (1811), contained the discovery of the distinction between sensory and motor nerves. Bell died in 1842. Mitscherlich was born at Neuende (Oldenburg) in 1794, and died in 1863. Orientalist as well as chemist, he worked for some time with Berzelius at Stockholm, becoming afterwards professor of chemistry at the University of Berlin. His observation that corresponding phosphates and arsenates crystallise in the same form was the germ of the theory of isomorphism, communicated to the Berlin Academy, of which he was a member, in 1819.

THE recent statement on the radium problem issued by the Radium Commission contains a much-needed warning against the exaggerated views on the possibilities of the therapeutic action of radium which have recently found expression in the daily Press. The problem presented by the treatment of cancer can only be properly understood by reference to the pathology of the disease. Cancer arises locally as a primary tumour. The primary tumour continues to grow locally and at the same time spreads, mainly through the lymphatic channels, to the neighbouring lymph glands. From there it spreads eventually to the more distant glands and to the internal organs, where the malignant cells grow as secondary deposits or metastases. Cancer can be cured with certainty in its earliest stage so long as it has remained a localised growth. It can then either be removed surgically or it can be destroyed by treatment with radium. Even when the malignant cells have begun to spread to the neighbouring glands, the cure is still possible if all the affected glands can be removed surgically or be subjected to treatment with radium. The recent advances in radiotherapy consist essentially in the fact that it has been possible to introduce radium, in the form of radium needles or of seeds containing radium emanation, into the growth and the surrounding tissues, so that a uniform irradiation of the growth and surrounding tissues can be ensured, and the malignant cells can be destroyed with certainty in the irradiated area.

THE difference between surgery and radiotherapy consists therefore in principle in the manner in which the attempt is made to free the cancer patient from malignant cells. Surgery does so by removing the tissues containing the malignant cells; radium destroys them *in situ*. Both methods suffer from the difficulty that their application is limited by the accessibility of the organs which are likely to be affected. There is no evidence that the destruction by radium of the accessible malignant cells confers upon the body the ability to rid itself of the malignant cells in the non-accessible site. In a word, radium is not a 'cure' for cancer, but, like surgery, a treatment for cancer. As with all other treatments, its success depends upon the skill and knowledge of the operator and, what is most important, on the stage of the disease at which it is applied. Early diagnosis is as important for the successful treatment by radium as for the successful treatment by surgery. One great point in favour of radium is that its use does not involve the risks and suffering associated with extensive and mutilating operations. There is therefore a reasonable hope that, with prospects of a cure without mutilation, patients should be far more ready to consult their doctors at an early stage so as to ensure early diagnosis.

ON Friday, Nov. 15, Sir William Bragg opened an exhibition of historical scientific apparatus belonging to the Royal Institution, which for the time has been removed to the Science Museum, South Kensington, while the alterations in Albemarle Street are being carried out. The exhibition has been arranged by permission of the Board of Education and with the aid of the staff of the Museum, and it will remain open to the public during the winter months. Founded by Rumford in 1799, the Royal Institution has been the home, study, or laboratory of Rumford himself, Davy, Young, Brande, Faraday, Tyndall, De la Rue, Rayleigh, Dewar, and other eminent men of science, and much of the apparatus used in their experiments has been preserved. We understand that altogether there are some 1200 pieces of apparatus, and that about 250 of these have been placed on view in the gallery near the Exhibition Road entrance of the Museum. Much care has been taken with the labelling, and it may perhaps be suggested that many visitors would like to be able to procure a brief catalogue for future reference. In opening the collection, Sir William Bragg referred to some of the more important exhibits and paid an eloquent tribute to the work of Faraday and others.

THE exhibits are arranged chronologically, beginning with those of Rumford, who experimented on heat, and ending with some X-ray apparatus illustrating the work being done at the Royal Institution at the present time. Of the exhibits we may mention the electric batteries provided by the Royal Society for Davy, and Davy's and George Stephenson's miners' safety lamps. Of Faraday's apparatus there is the original sample of benzene which he separated for the first time in 1825, the world-famous iron ring with which in 1831 he discovered electromagnetic induction, objects illustrating his work on magnetism, compression tubes used for his experiments on the liquefaction of gases, and specimens of his own making showing the very beautiful sand figures formed under rippling water. Tyndall's work is recalled by the apparatus he used for the study of heat absorption by gases and vapours, his fifty-year old broths used for disproving the spontaneous generation of life, while Dewar's work is illustrated by a series of vacuum vessels, a liquid hydrogen calorimeter, a little gas thermometer, and his beautiful soap bubble apparatus. While referring to this exhibition, we think the attention of the Office of Works should be directed to the inadequate artificial lighting of some of the galleries of the Museum, rendering the close examination of the objects and the reading of the labels unnecessarily trying.

A NOVEL suggestion in connexion with the shearing of South African sheep has been made by Prof. A. F. Barker, professor of textile industries in the University of Leeds, as a result of his observations in South Africa during the recent meeting of the British Association. Prof. Barker suggests that, instead of letting the sheep grow a twelve months' (or even eight or ten months') fleece, thereby creating difficulties which the manufacturer may only be able partially to overcome, the wool should be sheared to manufacturing requirements, say from 1 in. to the maximum length of staple, just as required. The desirability of this procedure, he alleges, is confirmed by experimental work carried out at the University of Leeds, which indicates, *inter alia*, the value of equality of length of fibre and maximum length beyond which there is disadvantage rather than advantage. So far a summary only of Prof. Barker's report has been published, and his suggestion appears to be of limited academic interest. The British Wool Federation, the principal trade organisation of the raw wool industry, is inclined to view the suggestion with scepticism, for it writes that "the suggestion that a fleece which might grow to 8 in. long might be sheared in so many separate inches at various times of the year to the advantage of the farmer is beyond the comprehension of those who have been engaged in the Cape wool trade for many years past".

ON Nov. 16 General Smuts delivered the third and last of his Rhodes Memorial Lectures at Oxford after receiving the honorary degree of D.C.L. in a special meeting of Convocation. The subject of the lecture was "Native Policy in Africa", a subject which he described as part of the great question of colour and civilisation destined to become the dominant issue of the twentieth century. The lecture was an eloquent, yet at the same time closely reasoned, exposition of the policy of 'segregation' in South Africa, which neither sought to minimise the mistakes of the past nor to pass over the difficulties which have to be faced in the near future. In both General Smuts finds lessons which may be a warning to the newer communities of other parts of Africa in finding a solution of their own native problems. The policy of segregation, which General Smuts traced back to the innovations of Cecil Rhodes in dealing with native affairs, contemplates, as is well known, the absolute separation of the white and native communities, the latter administering their own local affairs on their reservations.

As General Smuts pointed out, owing to the failure of both administrators and missionaries to appreciate the bearing of the results of the study of anthropology, instead of advancing the native they have helped to disintegrate native institutions and many steps had had to be retraced. Hence there are serious problems to be faced in South Africa to-day which other African communities with this example in view may succeed in avoiding. Of these, one is the detribalised as well as the educated native to whom the policy of segregation cannot be made to apply—a source of both economic and political difficulty; and secondly, the question of representation of the native in the supreme legislature. An intense sympathy for native institutions and a desire to secure the advancement of the native along lines in harmony with his culture informed the whole of General Smuts' lecture. In years to come it will rank as one of the most important statements on native policy ever made by an Imperial statesman.

LORD BLEDISLOE's offer to the nation in perpetuity of the Roman camp in his deer park at Lydney, Gloucestershire, is a public-spirited action which we hope will be appreciated at its full value, having in view the nature of the site. It will be remembered that the exploration of this camp was undertaken by the Society of Antiquaries and has been completed only recently. In certain respects, the site as a monument of antiquity is unique. It is a small hut-town standing on a commanding promontory jutting out from the Forest of Dean. Within its limits, it would appear to have been of some importance as a centre of iron-working and it includes within its boundaries the only iron mine yet found which can definitely be ascribed to the Roman period. According to an account in the *Times* of Nov. 15, the shaft of the mine is 1 ft. 6 in. to 2 feet wide and dips at an angle of 20°. It has been partly explored. On examination it was found that the surface of the rock still showed the marks made by the Roman miners.

THE main interest of the site, however, and the feature which makes its offer to the nation peculiarly welcome and appropriate, is the fact that we have here in this one area the evidence of a completed phase of British culture. The settlement begins with a civilisation still making use of bronze and showing affinities with Glastonbury and Meare, passes through a stage in which the native crafts give way to those of a Romano-British culture; and this in turn passes into a post-Roman phase in which the inhabitants sink back into a state of barbarism. One of the most interesting features of the site is the temple of Nodens, erected about 365 A.D., which, the evidence would suggest, was a great centre of healing. It may not be out of place to recall that Gloucestershire is one of the English counties rich in Holy Wells, which were at one time centres of healing, so that the cult of Nodens may perpetuate a still earlier cult. A debt of gratitude is due to Lord Bledisloe for an offer which will ensure the preservation of so interesting and important a site.

AT last a Committee has been appointed by the Government of Great Britain to consider whether it is desirable and feasible to create a national park. The attention of all concerned might profitably be directed to a 9-page pamphlet, issued as *Miscellaneous Publication*, No. 51, by the United States Department of Agriculture (September 1929). It gives a list of the national wild life reserves in the United States and indicates that the very argument which has been used against the creation of such areas in Great Britain, namely, the increase in population and the more intensive use of land, is just the argument which has led in America to the special protection of beasts and birds in reserves. Eighty-two areas, ranging in extent from rocky islets of 5 acres to the 2,000,000 acres of the Yellowstone Park, are administered by the Bureau of Biological Survey. They have been chosen primarily for their suitability for forms of wild life that have become greatly reduced in numbers or threatened with extinction. Some, even of great extent, are fenced for such large game animals as buffalo, antelope, mountain sheep, and wapiti. In addition to these areas, deliberately set apart as wild-life reservations, there are areas within national forests set aside for the protection especially of big-game animals; and wild life is given further protection in such places as national parks, national monuments, and lighthouse reservations, administered by other branches of the government for scenic, historical, or other special purposes. Surely here are hints in abundance for the creation of simple reserves in Great Britain.

WE have received from several correspondents comments on Mr. C. W. Marshall's letter on the magnetic reaction of the glowing filaments of carbon incandescent lamps which appeared in our issue of Nov. 9, p. 727, with a photograph giving an excellent impression of the visual appearance of the filament when vibrating. The phenomenon has been well known for at least forty years to electricians who are familiar with alternating currents. We agree with our correspondents in thinking that it can be satisfactorily explained by ordinary dynamical and electromagnetic principles. Forty years ago, Prof. Ayrton showed that if the wire of a monochord were of steel and carried an alternating current, and a magnet was brought close to the wire, small vibrations usually ensue. If, however, the weight be adjusted, we get a large vibration when resonance ensues. About a year afterwards, Dr. A. Russell varied this experiment by using an alternating current electromagnet, no current passing through the monochord wire. In this case, very large oscillations were obtained when resonance ensued. If l be the length of the wire in centimetres, m the mass of unit length of it in grams, and T be its tension in dynes, we have $f=\sqrt{T/m}/(4l)$, where f is the frequency, that is, the number of complete cycles of the alternating current.

THIS method of measuring frequency is well known in many electrical laboratories and is a very satisfactory one. The formula is deduced from ordinary dynamical and electrical principles. In the case of a glowing filament, whether of carbon or metal, having a few turns and carrying an alternating current, the helical part of the filament acts simply as an A.C. magnet, the polarity of the ends continually changing. Bringing up a permanent magnet produces repulsive and attractive forces on the filament and so it vibrates. We have often seen in an electrical laboratory a magnet brought near a coiled filament lamp, causing the filament to vibrate. Sometimes the vibrations are so large that the incandescent filament hits the glass bulb, causing the glass in contact with it to melt and so letting in the air and burning out the lamp.

THE *Realist* generally contains good articles, but there is unusual suggestiveness for the biologist in Prof. Julian Huxley's analysis of the size of living things, which appeared in the September and October issues. In the earlier number are given some striking size contrasts, and a skeleton classification of organisms grouped according to size emphasises some curious relations. The largest of living organisms are the big trees of California; the largest animals that have ever lived are whales. The smallest vertebrate is a frog—less than a queen bee, less than some of the Foraminifera. There are molluscs which belong to the same order of size as elephants, jelly-fish which rank with cattle and red deer. A diagram illustrating twenty-seven different organisms according to scale makes a series of vivid comparisons. The second article discusses the biological implications of size, and while it does not help to solve how animals attained their adjustments, it shows how the privileges and penalties of size have limited the course of evolution. Here also curious relations are brought out: the individual man is all but half-way between atom and star; humanity entire stands in the same position between electron and universe.

WILLIAM FROUDE'S original experimental tank for model trials of ship's hulls, which he built at Chelston, near Torquay, has been followed by many larger and better equipped tanks, of which the latest is the Italian National Experimental Tank in Rome, the opening of which took place on Nov. 3. An illustrated article on this new tank appears in the *Engineer* for Nov. 15, where it is described as "noteworthy as being the best equipped and, from the point of view of its harmonious dimensions, probably the finest tank of its type in the world". Constructed of reinforced concrete, the tank has a length of 275 m. (902 ft. 3 in.), a breadth of 12·5 m. (41 ft.), and a depth of 6·3 m. (20 ft. 7½ in.). The main carriage is designed for a maximum speed of 12 m. per second, and is adapted for testing hydroplane models as well as ship models and propellers. The model-shaping machine is designed to take a model 8 m. (26 ft. 3 in.) in length, and an interesting piece of apparatus designed by Dr. Gebers, the superintendent of the Vienna tank, is a measuring table furnished with micrometers in three directions, enabling the hull appendages, bilge keels, hull axis, and the propellers to be set in position on the hull with absolute accuracy.

THE provision of sufficient illumination is only a part of the problem of providing adequate lighting. Of equal importance is the avoidance of glare, a phenomenon which is familiar but not very easy to define. At a meeting of the Illuminating Engineering Society on Nov. 8, Mr. W. S. Stiles drew a distinction between 'disability glare', which is manifested when a bright source in the field of vision impairs the ability of the eye to distinguish small contrasts, and 'discomfort' glare, of which it is difficult to devise any ready test. Instructive experiments showing how the power of the eye to detect discs stencilled on a slightly darker background is affected by the presence of an unshielded electric lamp were performed. A demonstration of a method of evaluating glare based on the comparison of a lighting unit with a series of globes containing lamps of different candlepower was given. The intensity of glare is determined by a number of factors, such as the brightness (c.p. per sq. in.) of the source, its position in the field of view, its distance, and the nature of the background. Attempts have been made to express the influence of these factors by equations. Possibly, as was suggested in the discussion, glare is best regarded as due to excessive contrast in brightness. Early investigators considered that glare would be absent if the contrast in brightness of objects visible to the eye did not exceed 100:1, a condition that can be approached without undue difficulty in interiors, but seems almost impossible to realise in lighting streets and open spaces. What has long been needed is a simple test for determining quickly the degree of glare in an installation. Until this is available one is obliged to rely upon more or less empirical rules.

APPLICATIONS are invited for the following appointments, on or before the dates mentioned:—A visiting instructor of stained glass at the Central School of Arts and Crafts, Southampton Row, W.C.—The Education Officer (T.1), County Hall, Westminster Bridge, S.E.1 (Nov. 25). A lecturer in applied and pure mathematics in the University of St. Andrews—The Secretary and Registrar, The University, St. Andrews (Nov. 29). An assistant lecturer in the Department of Education of King's College, London—The Secretary, King's College, Strand, W.C.2 (Nov. 30). A lecturer in physiology in the University of Birmingham—The Secretary, The University, Birmingham (Dec. 3). A junior inspector under the Ministry of Agriculture for Northern Ireland—The Secretary, Civil Service Commission, 15 Donegall Square West, Belfast (Dec. 3). A lecture assistant in the Department of Physics of the University of the Witwatersrand, Johannesburg—The Secretary, Office of the High Commissioner for South Africa, Trafalgar Square, W.C.2 (Dec. 6). An assistant lecturer in chemistry at University College, Southampton—The Registrar, University College, Southampton (Dec. 16). A resident tutor for chemistry and rural science (plant biology and gardening) at the Winchester Diocesan Training College—Rev. the Principal, Diocesan Training College, Winchester. A part-time teacher for evening classes in brickwork in the School of Architecture, Building, and Surveying, of the Polytechnic, Regent Street—The Director of Education, The Polytechnic, Regent Street, W.1. A half-time assistant in the Department of Mathematics of the University College of Swansea—The Registrar, University College, Singleton Park, Swansea. Two junior researchers under the National Research Council of Canada for research work on, respectively, heat and aeronautics—The Secretary, National Research Council of Canada, Ottawa, Canada. An assistant chemist under the Research Association of British Paint, Colour, and Varnish Manufacturers—The Director, Paint Research Station, Waldegrave Road, Teddington.