Address of the President, Sir William Crookes, O.M., at the Anniversary Meeting on November 30, 1915.

Since our last Anniversary Meeting the Royal Society has lost many of its Fellows. Too long is the list of those who have passed. If my reference to their work is brief you will understand that is due to the exigencies of time, and not to lack of appreciation. No words of mine are necessary to perpetuate the memories of men whose names will live among those of the great masters of Science.

In April this year one of our oldest Fellows, William Grylls Adams, Emeritus Professor of Natural Philosophy at King’s College, London, died, after a life of great scientific activity, at the age of 79. He was Professor of Natural Philosophy and Astronomy at King’s College, London, from 1865 to 1906, and was elected a Fellow of the Royal Society in 1872. His researches covered a wide field, and he was the author of many memoirs in various branches of physics. In 1875 he delivered the Bakerian Lecture on the forms of equipotential curves and surfaces and lines of flow, and in the same year he published an important paper on the change of resistance produced by magnetisation in iron and steel. He made an exhaustive investigation of the effect of light in reducing the resistance of selenium, and devised a new form of measuring polariscope. In later years he made a special study of terrestrial magnetism, and he also published papers on the “Illumination of Lighthouses.” He was one of the founders of the Physical Society, and was its President from 1878 to 1880. He was also President in 1884 of the Institution of Electrical Engineers, and his inaugural Address on the growth of electrical science and the testing of dynamo machines and incandescent lamps was a valuable contribution to our knowledge. He served on the Council of the Royal Society from 1882 to 1884, and again from 1896 to 1898.

Dr. R. Assheton, who was one of the most eminent of British zoologists, died on October 24 from heart failure following influenza. Dr. Assheton has been described as the first experimental embryologist in England, and his new and original methods enabled him to correct some of the erroneous views of the older school of embryologists. His premature death, when his intellectual powers were still undiminished, is a heavy blow to science, and it will be felt nowhere more than at Cambridge, where he had recently been appointed Lecturer in Animal Embryology.
The death of Henry Charlton Bastian, which occurred on November 17, removes from our midst a physician of eminence, who will be remembered as the energetic champion of a theory of the spontaneous origin of life. He was at one time Professor of Pathological Anatomy, and afterwards Professor of the Principles and Practice of Medicine, at University College, London, and was also consulting physician to the National Hospital for the Paralysed and Epileptic. He was the author of many articles and monographs on paralysis, aphasia and speech defects, and diseases of the nervous system.

In Sir Arthur Herbert Church we have lost one whose position in the world of science was unique. He was a man of many and diverse gifts and interests, and was an artist of no mean skill and a recognised authority upon precious stones and porcelain. While Professor of Chemistry at the Royal Agricultural College, Cirencester, he did valuable work in agricultural chemistry—being, for example, the first to describe turacin, an animal pigment containing copper. He was also interested in mineralogy, and was the discoverer of the native cerium phosphate Churchite. In 1879 he was appointed Professor of Chemistry at the Royal Academy of Arts, and he then turned his attention to researches on paints and pigments, publishing a standard work on the subject, entitled 'The Chemistry of Paints and Painting.' He conducted an enquiry into the condition of the frescoes in the Houses of Parliament and the stonework of Westminster Abbey, in which his artistic and archaeological knowledge was invaluable. Sir Arthur Church, who died on May 31, was elected a Fellow in 1888.

In May the death occurred of Morgan William Crofton, who, after a brilliant career at Trinity College, Dublin, was for three years Professor of Natural Philosophy at Queen's College, Galway, and afterwards Professor of Mechanics and Mathematics at the Royal Military Academy, Woolwich. On his resignation in 1884 he was appointed to a Fellowship of the Royal University of Ireland. Dr. Crofton, who was elected a Fellow of the Royal Society in 1868, was the author of papers on Mechanics and Geometry, but is perhaps best known for his work on Probability, upon which subject he contributed an article in the ninth edition of the 'Encyclopaedia Britannica.'

David Douglas Cunningham, who died in December, 1914, rendered great services to science and to the State by his studies of tropical diseases generally, and of cholera in particular. From 1869 to 1879 he devoted all his energies to the investigation of cholera from a pathological point of view, and in 1879 he was appointed Professor of Physiology at the Medical College at Calcutta, where his gifts and the charm of his manner won him great success as a teacher of Indian students. Besides his work in pathology,
Cunningham carried out numerous researches in cryptogamic botany, and made exhaustive studies of the diseases of plants and of snake venom, and he also made time to perform the duties of many public offices in India. He was elected a Fellow of the Royal Society in 1899.

The death of James Geikie, the younger brother of Sir Archibald Geikie, is a great loss to science and to his many friends. When quite a young man he took an active part in the Geological Survey of Scotland, and published many papers giving the results of his observations. He afterwards went to Gibraltar with Andrew Ramsay, the Director of the English Geological Survey, to prepare a report on its water supply. In 1874 he published the first edition of his famous book ‘The Great Ice Age.’ In 1882 he was appointed Murchison Professor of Geology and Dean of the Faculty of Science at Edinburgh, and thenceforward he devoted himself chiefly to teaching and the preparation of the many valuable educational works which bear his name. He was one of the founders of the Royal Scottish Geographical Society, and was its President for some time. He was a highly successful and inspiring teacher, and was one of Edinburgh’s most distinguished scientific men.

Sir William Richard Gowers, who died on May 4, had won an international reputation in medicine. His researches dealt chiefly, but by no means exclusively, with neurology. He studied the diseases of the heart and blood-glandular organs, and was the inventor of an instrument for determining the amount of haemoglobin in blood. In 1880 he published his work on the ‘Diagnosis of Diseases of the Spinal Cord,’ and the following year a book on Epilepsy, founded on his observations made at the National Hospital for the Paralysed and Epileptic, where he held the post of physician. His chief work was the admirable and widely used ‘Manual of Diseases of the Nervous System.’ He was elected a Fellow of the Royal Society in 1887 and knighted in 1897.

Dr. Arthur Sheridan Lea, who died in March at the age of 61, was one of the founders of the Cambridge Physiology School, his research work dealing chiefly with the chemical changes of food during digestion, and the action of rennet and fibrin ferments. He was a Fellow of Gonville and Caius College, and was appointed University Lecturer in 1884. Unfortunately his active career was prematurely cut short by spinal disease, and his later years had been spent in retirement and rest, although he followed with unabated interest the work of his friends and pupils.

Richard Lydekker, who was one of the most prolific writers upon zoology and natural history, died in April of this year. His first scientific work was connected with the Geological Survey of India, and he made a
very thorough study of the zoology and geology of Kashmir. Afterwards he devoted himself more to palæontology, and between 1885 and 1887 he was engaged on the preparation of a catalogue of fossil mammals in the Department of Geology of the British Museum, while some years later he spent some time making a study of the fossil vertebrates in the La Plata Museum. From 1896 until his death he was occupied with the reorganisation of the Mammalian Exhibition Galleries of the Natural History Museum, in which he achieved conspicuous success. A very rapid worker, he published an enormous number of technical and popular articles, and he also co-operated with Sir William Flower in 'An Introduction to the Study of Mammals,' and edited the 'Royal Natural History.'

It was with deep regret that we heard that Prof. Raphael Meldola died suddenly on November 16, at the age of 66. Prof. Meldola was an eminent authority upon the manufacture of coal-tar colours, having worked for many years in the colour works of Messrs. Brooke, Simpson, and Spiller, where he had made important discoveries of new methods and processes. In 1885 he became Professor of Chemistry at the Finsbury Technical College. He was a member of the recently appointed Advisory Council for the Organisation and Development of Scientific and Industrial Research, and was an ardent advocate of the necessity of fostering pure research in order to arrest the decline of industry in this country. He was the author of valuable text-books upon the Chemistry of Photography and the Chemical Synthesis of Vital Products, and also translated and edited Weismann's 'Studies in the Theory of Descent.' He was elected President of the Chemical Society from 1905 to 1907, Fellow of the Royal Society in 1886, and Davy Medallist in 1913.

We were much grieved to learn that the renowned zoologist, Prof. Edward Alfred Minchin, had passed away, and the gap he leaves in the scientific world will long be unfilled. In spite of the handicap of ill-health in his youth, Minchin was very successful at Oxford, where he was finally elected Fellow of Merton College. After spending some time in research work at foreign marine zoological stations he returned to Oxford as assistant to Sir Ray Lankester and Demonstrator of Comparative Anatomy, and in 1899 was appointed to the Jodrell Professorship of Zoology at University College, London. Subsequently, he became the first Professor of Protozoology at the University of London, and Director of Protozoology at the Lister Institute of Preventive Medicine at Chelsea. In 1911 he was elected a Fellow of the Royal Society. The value of his research in zoology has been fully recognised both in this country and abroad, and in the branches which he made specially his own he had no rival. The refinement of his methods, his
accuracy and attention to detail, were inimitable, and he put a high ideal of
carefulness and thoroughness before his pupils. He published a valuable
text-book, 'An Introduction to the Study of the Protozoa,' which has come
to be regarded as the standard work on the subject, and he wrote articles in
the scientific journals and the 'Encyclopædia Britannica,' and was an
important contributor to Lankester's 'Treatise on Zoology.' A man of
striking originality and of great gifts, he will be deeply mourned by his
many friends.

Dr. Hugo Müllcr, whose death occurred on May 23, was elected a Fellow
in 1866. He had long been resident in this country, and in his early years
did valuable scientific work, which he resumed when he retired from his
position as partner in the firm of De la Rue and Co. With Dr. Warren De
la Rue he devised the chloride of silver-zine constant battery, and he
discovered the value of iodine as a catalyst in chlorination. Of late years he
had worked at the Davy-Faraday Laboratory of the Royal Institution, and
published many articles in the 'Journal of the Chemical Society.'

The death of Admiral Sir George Strong Nares has robbed the world of
a distinguished scientific man who had served his country in more than one
capacity. He did valuable geological work in the Arctic Expedition of
1852-1854 under Captain Kellett, and after a period devoted to the training
of cadets, during which he wrote an excellent book on seamanship, he surveyed
Torres Strait, part of the coast of Australia, and the Gulf of Suez. He was
a member of the "Challenger" Expedition, but was recalled to take
command of a scientific Arctic expedition, which reached 82° 27' N. The
geology and biology of Grant Land and Greenland were thoroughly examined
by the party, and Captain Nares himself took the astronomical, meteorolo-
logical, magnetic, and tidal observations. In 1878 Sir George Nares
surveyed Magellan's Strait. He was later appointed Professional Officer in
the Harbour Department of the Board of Trade, and subsequently Con-
servator of the Mersey.

We have lost in Francis Henry Neville a metallurgist whose researches
were marked by great precision and acumen. In 1888, in conjunction with
Mr. C. T. Heycock, he began the investigation of the lowering of the
freezing-point of metals by solution in metals, and since that date he had
continued his researches on alloys, the most important and complete being
those on tin and copper. His mathematical ability and training (he took his
degree in the Mathematical Tripos in 1871) were of great assistance to him
in his work on the alloys, and he brought a cultured mind and a sound
judgment to bear upon the problems which he so successfully solved.

Sir Andrew Noble, whose death occurred on October 22 at the age of 84,
possessed an unusual combination of talents, to which his tireless energy enabled him to give full play. His inventive genius first manifested itself in the design and improvement of naval and military guns, and the firm of Armstrong, Whitworth, and Co., Limited, owed a great debt to his keen business spirit. In 1875, with Prof. Abel, he began his highly important and original work on explosives which has made his name known all over the civilised world. He served on the Council of the Royal Society four times, and was the recipient of the Royal Medal.

Sir Arthur William Rücker, whose death at the age of 67 occurred on November 1, was a man of conspicuous organising ability and an excellent teacher and lecturer. In 1874 he was chosen as the first Professor of Mathematics and Physics at the Yorkshire College, Leeds, and afterwards occupied the Chair of Physics at the Normal School of Science, South Kensington. In 1901 he was elected Principal of the re-organised University of London, and there performed a difficult task with excellent tact and judgment. He became a Fellow of the Royal Society in 1884, and was one of the Secretaries from 1896 to 1901. He was the recipient of a Royal Medal in 1891. His most important scientific work was connected with terrestrial magnetism, and he took a leading part in the Magnetic Survey of the British Isles, preparing a memoir on the subject for the Bakerian Lecture in 1889.

Dr. William James Sell, University Lecturer and Senior Demonstrator in Chemistry at Cambridge, who died in March, was a man of great ability and untiring perseverance, who played a most useful part in the training of students at Cambridge in experimental science. He gave many successful courses of lectures in chemistry, and when opportunity offered he showed that he was capable of successful research, one of his most important pieces of work dealing with the chloro-derivatives of pyridine.

Mathematical science has lost one of its most distinguished exponents by the death of Prof. Henry William Lloyd Tanner, to whose educational and administrative talents the University of South Wales and Monmouthshire is deeply indebted. His views on the mathematical training of students were thoroughly sound, and his services to education were by no means limited to his College or University. In addition to his teaching and administrative work at Cardiff he published many important investigations in mathematics, dealing firstly with the solution of partial differential equations and secondly with the theory of numbers. These latter researches, which were distinguished by great ingenuity and originality, were not by any means completed when failing powers forced him to resign his professorship and cease work.

Lieutenant-General James Francis Tennant, Past-President of the Royal
Astronomical Society, did valuable work in connection with the Great Trigonometrical Survey of India from 1854 to 1869, and was afterwards responsible for a great number of observations in the total eclipses of 1868 and 1871 and the transit of Venus in 1874. He was most assiduous and enterprising in perfecting methods and collecting data, and the conclusions he drew from his observations were of fundamental importance. For the last 20 years he had done no active scientific work, but he had followed with the keenest interest the developments of astronomy. He died on March 6 at the age of 86.

Three distinguished representatives of our Foreign Members have died since our last Anniversary Meeting. The name of Émile Hilaire Amagat is familiar to the physicists of all nations as that of the investigator of the behaviour of gases under pressure, and the brilliant series of researches which he carried through to a successful conclusion showed him to be an experimenter of truly remarkable powers. He determined the compressibility of a number of fluids, and also investigated the effect of pressure upon the freezing points of liquids. During recent years he had been engaged upon the compilation and arrangement of the numerical data obtained in his experimental work dealing with the specific heat of gases, the internal pressure of fluids, and the corresponding states of matter. Prof. Amagat was elected a Foreign Member of the Royal Society in 1897, and in 1906 he was President of the French Physical Society.

Astronomy has suffered a severe loss by the death of another of our Foreign Members, George Friedrich Julius Arthur Auwers, whose work in connection with the co-ordination of astronomical observations showed him to be a man of extraordinary patience and thoroughness. His chief work was the re-reduction of Bradley’s observations, to which he devoted some ten years of his life, and the preparation of an exhaustive catalogue of stars for the German Astronomical Society. He was a member of many German Astronomical Expeditions, including that for the observation of the transit of Venus in 1874, and he assisted Sir David Gill in observations for the determination of solar parallax at the Cape Observatory in 1889. He was the discoverer of the star “Nova Scorpii,” and made many valuable observations of variable stars.

The sudden death of Prof. Paul Ehrlich in August brought to a close a career of great scientific activity and notable achievements. After graduating in medicine, Ehrlich turned his attention to the affinities of cells for various reagents, and some of the methods and staining agents he employed are still in constant use in biological work. He elaborated a method of standardisation of diphtheria antitoxin, and was the originator
of the side-chain theory of antibodies. His name is probably best known in connection with "606," or Salvarsan, as a cure for syphilis. He was elected a Fellow of the Royal Society in 1910, and he was the Croonian Lecturer and the joint recipient with Metchnikoff of the Nobel Prize.

Finally, it is my sad duty to express the regret of the Royal Society at the death of one who, though he had not yet been elected a Fellow, had done work which fully deserved the highest recognition. If his days had been longer he would undoubtedly have ranked amongst our great physicists. On August 10 Henry Gwyn Jeffreys Moseley, Second Lieutenant in the Royal Engineers, died a soldier's death at the Dardanelles. Although only 27, he had published remarkable work. His examination of the X-ray spectra of different elements led to the important discovery that the properties of an element are determined by its atomic number—which marks a notable advance in our knowledge of the structure of the atom. He was instantaneously killed in the execution of his duty. The whole world is the poorer for the tragedy by which he was—

"Gathered to the Kings of Thought
Who waged contention with their time's decay,
And of the past are all that cannot pass away."

In the Report of the Council a brief outline is given of the activities of the Royal Society in connection with the scientific problems which confront us in consequence of the war. Towards the end of last year a War Committee and Sub-Committees were appointed to consider a variety of questions, including the supply of drugs and other chemicals which hitherto have been mostly imported. It was finally decided that it would be best for the Council as a whole to act as a general War Committee, the original sub-committees being converted into four sectional committees, which have met regularly throughout the year. A Memorial to the Prime Minister was drawn up, calling attention to the urgent need for closer co-operation between those engaged in scientific research and the directors of the nation's industries, and was presented by delegates of the Royal Society and the Chemical Society. The President of the Board of Education has since issued a scheme for the Organisation and Development of Scientific and Industrial Research, which has met with approval on all sides, and which indicates that the Government is ready to give the country a strong lead in the way of recognition of the value of scientific training and work. An important step has been taken in appointing a Committee to prepare a scheme for the establishment of a permanent Board in collaboration with
technical and other scientific societies for the discussion of questions in which joint action appears desirable.

Owing to unavoidable delay in printing, the Royal Society’s Catalogue of Scientific Papers has progressed only slowly, and there appears to be no likelihood of its being completed at the present rate until the middle of 1921. The Director of the Catalogue, Dr. McLeod, who has been indefatigable in his labours, has been obliged by ill-health to retire. It is proposed not to appoint a new Director, but to continue the work under the able management of the Chairman of the Catalogue Committee, Prof. Silvanus Thompson.

Another of the Society’s tasks, the Magnetic Re-Survey of the British Isles, has been continued at a reduced rate and with some interruptions throughout the year just passed. At present only the Hebrides, Isle of Man, Channel Isles, and six points in England and Wales remain unresurveyed.

The Copley Medal has been conferred upon Prof. Ivan Petrovitch Pavlov, one of our most distinguished Foreign Members, whose researches in physiology have led to the acquisition of valuable knowledge. By a most ingeniously worked out and original method of making fistulae or openings to the exterior, Prof. Pavlov has successfully studied the inter-relation of the functions of the alimentary canal. His experiments have shown how the presence of food in one cavity controls the secretion of digestive juices into the next, and he has made many discoveries concerning the conditions which influence the secretory process, while his method has facilitated the study of the chemical changes which occur in the food as it passes through the canal. Moreover, by the method which he calls that of conditioned reflexes, Prof. Pavlov has studied, from a physiological point of view, the influence of the higher brain centres upon the secretion of saliva. He has also investigated the mechanism of the muscle by which bivalves open and close their shells, and the nervous control of the heart, especially through the sympathetic nerves. His resourcefulness and skill have enabled him to make important contributions to physiological science, and his work, the true worth of which has, perhaps, not yet been rightly prized, deserves the fullest recognition.

The Royal Medal given annually for physical investigations has been awarded to Sir Joseph Larmor, whose work in mathematics and physics includes a very wide range of subjects—geometry, dynamics, optics, electricity, the kinetic theory of gases, the theory of radiation, and dynamical astronomy—upon all of which he has published illuminating memoirs. Possibly his chief claim to distinction is the establishment of the theory that radiant energy and intramolecular forces are due to the movements of minute electric charges. This theory is fully worked out in his treatise 'Æther and
Matter.’ For a long time Sir Joseph Larmor acted as Secretary to the Royal Society, performing the duties of the office with great success, at the same time continuing with unabated vigour original research. The offer of the Royal Medal is a mark of the Society’s appreciation and admiration of his invaluable services to science.

The other Royal Medal, for work in the biological sciences, is this year conferred upon Dr. William Halse Rivers, whose work in ethnology has contributed largely to the establishment of the subject upon a scientific basis. He was the first to use the genealogical method in ethnological investigations. His remarkable originality, combined with sound judgment, have enabled him to produce work which will rank with the best that has been done in ethnology.

All chemists will agree that the award of the Davy Medal to Prof. Paul Sabatier is fully justified. His lengthy researches on the use of finely divided metals as catalysts are universally known. The hydrogenation of unsaturated organic compounds, especially by means of nickel, has been thoroughly elucidated by Prof. Sabatier and his co-worker, the Abbé Senderens. The industrial application of the process to the unsaturated acids of the oleic series has already acquired considerable industrial importance. It gives me great pleasure to announce the award, so well earned by Prof. Sabatier.

The Hughes Medal is awarded to Prof. Paul Langevin, who has made valuable contributions to electrical science, both on the theoretical and experimental sides. He has found by experiment the rate of re-combination and the mobility of ions produced by different processes in gases at various pressures, and he has made an exhaustive study of the theoretical aspects of the interdiffusion of gases and the mobility of ions.

We meet to-day in circumstances of unparalleled gravity. I am sure we are all deeply conscious of the imperative necessity of modifying the methods of our activities, correcting mistakes, and planning reforms without which we cannot hope to maintain our position among the nations. England, our England, is passing through a fiery furnace of stress and discipline, and we must face without flinching the bitter lessons to be learned.

The nation’s attitude towards science is, I think, largely due to the popular idea that science is a kind of hobby followed by a certain class of people, instead of the materialisation of the desire experienced in various degrees by every thinking person to learn something about innumerable natural phenomena still unsolved; and, having learned, to control and apply them intelligently for the benefit of the human race. Many attempts have been made to explain exactly what is meant by science, and to
differentiate true science from its counterfeit; and it is by no means easy to define it so that the vague general idea of the average man can be replaced by clear and precise conception. Even the most patient investigator, the most acute observer, must constantly feel "Oh, what a dusty answer gets the soul when hot for certainties in this our life." If we refer to our Charter, we shall find that the aim of the Royal Society is promoting Natural Knowledge by Experiments, and if we regard science as synonymous with natural philosophy we may describe it as knowledge relating to natural objects and phenomena connected therewith based upon experiments. Life has been defined as the act of correspondence with our environment, and science may equally tersely be defined as the use of intelligence in effecting that correspondence.

I believe that the "hobby" attitude is due to our national character, and can only be rectified slowly, step by step. We cannot suddenly become a truly scientific nation, either now during the war, or immediately on its conclusion. We shall have to make many fundamental alterations in our ideas and almost to change our natures before such a change can be effected. First among our defects must surely be placed mental inertia, our reluctance to do our thinking for ourselves and the slowness of our intellectual apprehension. This condition is fundamentally different from docility of mind, and its results are more disastrous because it tends to inhibit action on the part of those who should be leaders. Associated with it of course is our inherent stolid conservatism, which makes us too readily satisfied to continue in the ways of our forefathers—ways which, though good enough once upon a time, are now obsolete and undesirable. We are sometimes prone to under-estimate our opponents' abilities and powers, and usually we have a hearty contempt for outside criticisms of our methods. Our mental inertia makes us slow to put our latent organising power into action.

The problem before us is twofold. We have, firstly, to find out how best to organise all our present forces and employ the material at our disposal to win victory. Many suggestions have recently been made as to the best way to mobilise science and invention, so that, for example, schemes that show some likelihood of having military or naval value can be put at once to the test. At the beginning of the war the Royal Society appointed Committees for this purpose. Their scope could be extended usefully. They include men of naval and military experience, whose practical skill and knowledge supplement the theories of men of science. The second part of the problem is closely interwoven with the first, and its importance to the nation is hardly inferior. If we neglect to alter our ways, if we continue to disregard the value of scientific work and are content with ignorance of scientific methods on the
part of the authorities, we shall assuredly suffer total defeat in the industrial war which must of necessity follow upon the conflict of arms now raging. This is a matter in which men of science have a great responsibility to the nation. We must not cease to bring to the notice of the public the facts of which we are too fully aware. The attitude of the Government and the public towards science has been mistaken. For this formidable error we suffer and, I fear, must long continue to suffer. The remedy involves many sacrifices and heavy expenditure, probably at first without apparent return. It is to the New Generation now being educated that we must look for betterment of our position; and it is for youth we must now make plans. We must make all education more scientific. It is admitted we have much to learn from our adversaries; we must bring scientific methods to the front. As a well-known writer has said of our young generation, "We must not let their schooling interfere with their education." I am, however, glad to note that already there are signs on the part of some of our larger companies and more intelligent manufacturers of a disposition to remedy shortcomings. The numerous "Polytechnics" that spring up in every manufacturing town (some wonderfully well equipped and organised) are turning out men with at least an insight into the scientific principles that underlie their particular spheres of work, and such men find their services readily accepted. There are also within my knowledge many instances where manufacturers encourage their lads to attend these institutions, giving them the necessary time and opportunity. But so far this is the isolated action of a few individuals, and needs both encouragement and organisation.

Should not science be represented on the Privy Council? It is astonishing that in so august a body science is almost ignored. Ought we not to have in the Cabinet a Minister of Science with a board of advisers similar to that of Agriculture, with the proviso that the Minister of Science should hold his office primarily by virtue of his scientific capacity? Power of organisation and general business ability should be regarded as essential secondary qualifications. The newly appointed Science Councils and Committees might be incorporated under the Ministry of Science—then, and then only, pure research would begin to take its place as an invaluable profession, with a status of its own at least on a level with that of other learned professions. The leaders of its rank and file would be doing work of fully as much value to the nation as the work of the officers of our naval and military forces. Then, I feel convinced, the next generation would see the disappearance of listless co-operation between manufacturer and scientific worker, and we should hear less of the inferiority of British science as compared with that of our opponents. Given equal opportunities, our men would speedily give
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proof of fertility of ideas, of organising powers, and of resource and initiative. Research could be so thoroughly well organised that suitable workers would be jointly engaged with those problems for the speedy elucidation of which there is the greatest need, and the results of their investigations would be at the disposal of all British manufacturers. It rests with us to keep these ideas before the mind of the public, now that at last it is ripe to consider them. "Be wise to-day; 'tis madness to defer."

And now I must pass on to my latest task—perhaps the most fateful of all the tasks I have ever undertaken. I bid a sincere regretful farewell to my official colleagues of the Royal Society, whose unfailing and courteous help in my discharge of the duties of the presidential office I gratefully acknowledge. I deeply appreciate the honour conferred on me during the last two years, and if I may utilise "an intelligent appreciation of events before they occur" I heartily congratulate the Society on its election of my successor. We all know, and the world knows, the lofty place held by Sir Joseph J. Thomson in the august realms of science—and we all must feel that our Society could not have selected a more suitable and distinguished President.

On a Method of Estimating Distances at Sea in Fog or Thick Weather.

By J. Joly, Sc.D., F.R.S.

(Received October 20, 1915.)

The problem of estimating distances at sea in fog or thick weather is obviously one of much importance to navigation. Notwithstanding the more perfect means of communication between ship and shore, or between ship and ship, which recent scientific advances have secured, and which are at the command of the more important ships and lighthouse stations at the present time, I can find no reference to the fact that these improved means of communication suffice to solve the problem referred to under a great variety of circumstances. In the present paper I shall confine myself to the determination of distance between ship and shore. In a subsequent paper I hope to discuss the application of the methods involved to finding the distance between ship and ship, and thereby lessening risk of collision.

The method I have to propose is based generally on the differing velocities