

## THE MYSTERY OF LIGHT

(By Prof. Kerr Grant, M.Sc.)

The spear-point of research in modern physics is aimed at the age-old problem of the nature of light and the character of its relationship and interaction with matter. The view that light is essentially an electric wave motion, put forward over 60 years ago by Clerk Maxwell and confirmed by the never falling agreement of the conclusions based on this theory with the results of experiment, has found an harmonious counterpart in the theory of the electrical constitution of matter.

These two theories do, indeed, beautifully supplement and mutually support each other. The emission of electric waves from material atoms is readily understood if we concede that these atoms are minute electrical systems capable of vibrating with the requisite rapidity, and the various transformations which matter can impose upon light—to absorb, reflect, refract, polarise, or scatter—have all been shown to be capable of clear and consistent explanation on the basis of electrical theory.

### Outstanding Difficulties

Notwithstanding these triumphs, some outstanding difficulties remained. The light emitted by gases and vapors when excited to luminosity by the passage of electrical discharges or otherwise has for each particular gas or vapor a characteristic quality. When the spectrum of such emitted light is produced by passing a narrow beam through a prism combined with suitable lenses it is invariably found to consist, not of a continuous band of color, as does that of white light from an incandescent source, but of a discrete set of colored lines or bands in definite positions, each position denoting a definite value of the frequency of the waves which compose the line or band.

This implies that the atom is capable of vibrating not in one mode alone but in a large number. In this there is nothing singular, for the same property of multi-vibration characterises a string or plate or pipe of air.

But whereas the rates of the different modes of such vibrators are connected by a simple relation and governed by well-understood mechanical principles, the relationships of the frequencies of the different light waves emitted by an atom and the mechanism of their production long baffled all attempts at explanation.

Similar difficulties were found in the case of other optical phenomena, notably in the remarkable power which light of short wave length possesses of causing a metal surface on which it is directed to emit electrical particles.

### New Physical Principle

In the year 1900 an entirely new physical principle was propounded in regard to the emission or absorption of light by atoms—a principle which has since then become celebrated under the title of the "Quantum Theory." This theory asserts that an atom which is capable of radiating must first become possessed in some manner of an excess of energy over and above its normal quota. It will then sooner or later proceed to disgorge this excess by sudden spurts or quanta of definite amount.

Similarly an atom which is absorbing light can do so only in gulps. A simple relation, a relation of direct proportionality, is postulated between the magnitude of the quantum emitted or absorbed and the frequency of the waves. Thus red light, for which the number of waves a second is known to be only half as great as that of the waves which correspond to blue light, is emitted in quanta of half the energy value.

A complete and satisfactory theory of the spectrum of the light emitted by hydrogen gas was given on these lines by the Danish physicist Niels Bohr in the year 1912. Since then the quantum theory has been applied with extraordinary success, on the one hand, in unravelling the relationships existing in the most complicated spectra, some of which consist of many thousands of

lines, and, on the other, it has proved itself a key to unlock the mysteries of atomic structure and to reveal the very size and shape of the minute orbits in which the electrons whirl round the central nucleus of the atom.

### Fertile Lines of Research

Many new and fertile lines of research in both physics and chemistry have been opened up by the clues it has furnished to the nature of atomic processes. Yet despite such successes certain difficulties in the way of its complete acceptance remained.

In particular the apparent power of the radiated wave trains to retain their full quantum of energy is extremely difficult to reconcile with the attenuation which waves must undergo as they spread farther and farther from their source. In the striking metaphor employed by Sir William Bragg, it is as if the waves set up by the fall of a plank from a height into the sea had the power after travelling any distance to eject a similar plank to the same height.

Einstein, a pioneer no less in quantum theory than in relativity, boldly propounded the view that all light radiation is, as it were, tied up in quantum bundles. That is to say, a train of waves, however far it may spread, retains its original coherence. The difficulty of reconciling this idea, which almost returns to the old and discarded conception of "light corpuscles" with the indisputable wave properties of light, or even with the action of a lens, seemed to many men of science quite insuperable.

Two years ago, however, an American physicist, Compton, conducted an experiment on the scattering of X-rays by matter, which gives decisive support to such a corpuscular theory. He proved that a train of such extremely short light waves—for such only are X-rays—was capable of interacting with a single electron in precisely the same way as one cricket ball affects another by collision in the air. The corpuscular view of the nature of light has thus received a new lease of life. Yet light remains indisputably a wave motion.

Verily, science is here impaled upon the horns of a dilemma.

REG. 7-7-28

## PUBLIC ACCOUNTANTS.

### Royal Charter Explained.

### Professional Status Recognised.

The cabled advice of the granting of a Royal Charter for practising public accountants for Australia, as announced in The Register on Friday is very welcome to the members of the profession, and also to the financial and business communities generally. The desirability of it has been apparent for many years, for it is to give to the practising public accountant in Australia a status recognised throughout the British Empire, and indeed the whole world, that of chartered accountant. It has long been recognised that the question of professional qualifications should be looked at and dealt with imperially in the best interest of the whole Empire, and the hope has been expressed by those who have worked unremittingly to obtain the grant that the day is not far distant when the chartered accountant, whether he belongs to Australia or any other British Dominion, will be able to carry on his profession under the best auspices, wherever he may travel.

### Disadvantages Overcome.

The benefit to the Australian who follows this calling, and whose business has led him to what is known as the Far East is well known to those who have been in any way interested in affairs there. Young Australians with enterprise have, in many cases, sought to establish themselves in China and the East generally, and have always found that as they were unable to describe themselves as chartered accountants, they were at a considerable disadvantage, inasmuch as many documents drawn up in the old country and elsewhere particularly define the distinction chartered accountant as requisite to any one, who has to perform accountancy services. Australian Governments have talked "encourage our Eastern trade," and at various times con-

sidered the appointment of Trade Commissioners for the East, but the Australian public accountant who goes to the East to take up a business appointment is exceptionally useful in the encouragement of our trade, and has the advantage of costing the country nothing.

### History of Charter.

The principal chartered institute is the Institute of Chartered Accountants in England and Wales, incorporated by Royal Charter on May 11, 1880. The number of its members in 1927 was 7,242, of which 1,508 were Fellows-in-Practice. The earliest charter was granted to the Society of Accountants in Edinburgh, incorporated by Royal Charter on October 23, 1854. The next was the Institute of Accountants and Actuaries in Glasgow, incorporated by Royal Charter on March 15, 1855; then followed the Society of Accountants in Aberdeen, incorporated by Royal Charter on April 10, 1867. Later these bodies have formed a united body under the title of Association of Scottish Chartered Accountants in London, the total membership in the United Kingdom and abroad being 2,294. It is interesting to note that the first application on behalf of Australia made to the King was in 1905. That application was made by the Incorporated Institute of Accountants, Victoria, and was unsuccessful on the ground that if a charter was granted, it should be granted to all Australia, and not to one State alone. In 1907 the Australasian Corporation of Public Accountants was formed—its membership being confined solely to practising public accountants and their clerks. In the 1927 records the membership of the Australasian Corporation of Public Accountants was 673. Application was made by this body in 1909 to obtain a charter; but for various reasons (not necessary to be gone into now) this was unsuccessful. A third effort was made in 1923, but the conditions that pertained and were required by the British authorities were not at that particular stage fulfilled. Again in 1927 the matter was revived, and a further application made, and full details of the conditions and terms of the charter are expected by an early mail. It is understood that the nominees for the first council under the charter just granted are drawn equally from the members of the councils of the Australasian Corporation of Public Accountants and the Commonwealth Institute of Accountants.

### South Australian Representation.

South Australia is represented on the general council of the Australasian Corporation of Public Accountants by Mr. A. E. Hamilton—who, with Sir George Mason Allard is a vice-president—and Mr. H. H. Austin. Members of the State council are:—Messrs. H. H. Austin (chairman), G. R. Annells (vice-chairman), T. Howard Burgess, J. Council, A. E. H. Evans, A. D. Hamilton, Edward Kay, J. I. Key, W. Neill and R. M. Steel (registerar). There are 51 members in South Australia, and 651 in the Commonwealth.

NEWS 7-7-28

## FORESTRY EXPERT

Brilliant South Australian

### DELEGATE TO CANBERRA

Mr. R. L. Robinson, O.B.E., B.A. (Oxon), B.Sc. (Adelaide), will be a member of the Empire Forestry Conference, which will meet at Canberra Forestry School on Wednesday, September 26.

Born at Macclesfield 45 years ago, he attended the local school, and later went to the State School at Port Adelaide. There he won a Government Exhibition in 1896 and went to St. Peter's College. At that school in 1897 he won two scholarships—the May for chemistry and the Christchurch for classics.

After leaving St. Peter's College Mr. Robinson went to the School of Mines and Industries, where he won another scholarship, and proceeded to the University. There he took his Bachelor of Science degree. Mr. Robinson transferred to Western Australia, and obtained a position in the costs and drawing office of the Golden Horseshoe Mine.

### Science and Sports Master

In 1904 he became science and sports master at Townsville Grammar School in succession to Mr. N. W. Jolly (Chief Commissioner of the New South Wales Forestry Commission), who was appointed first South Australian Rhodes Scholar. In 1905 Mr. Robinson was selected to be the second Rhodes Scholar for South Australia. At Oxford his career was as brilliant as it had been in Australia. He was at Magdalen College from 1905 to 1909, and studied Natural Science (geological) and obtained first-class honors. In 1907 he gained his Bachelor of Arts degree, and in the same year won the Burdett-Coutts scholarship. A year later he was awarded his Forestry Diploma.

### Filled Many Positions

Mr. Robinson was also a fine sportsman.

Twenty years ago he was a member of Oxford cricket team which played against Cambridge. In the inter-university athletic sports he put the weight in 1907, 1908, and 1909. He was also a member of Oxford lacrosse team from 1906 to 1909.

From 1909 to 1912 he was on the Board of Agriculture and Fisheries in London. He married in 1910 Miss Charlotte M. Bradshaw. From 1912 to 1915 he was Superintending Forestry Inspector and Consulting Forest Officer to Crown Woods. In 1915 and 1916 he was in the Explosives Department of the Ministry of Munitions and for the next three years was secretary to the Forestry Sub-commission of the Reconstruction Commission of the Cabinet. He was made an officer of the Order of the British Empire in 1917, and in 1919 on the formation of the British Forestry Commission, Lord Lovat (who was appointed chairman) selected him to be technical commissioner, which position he still holds.

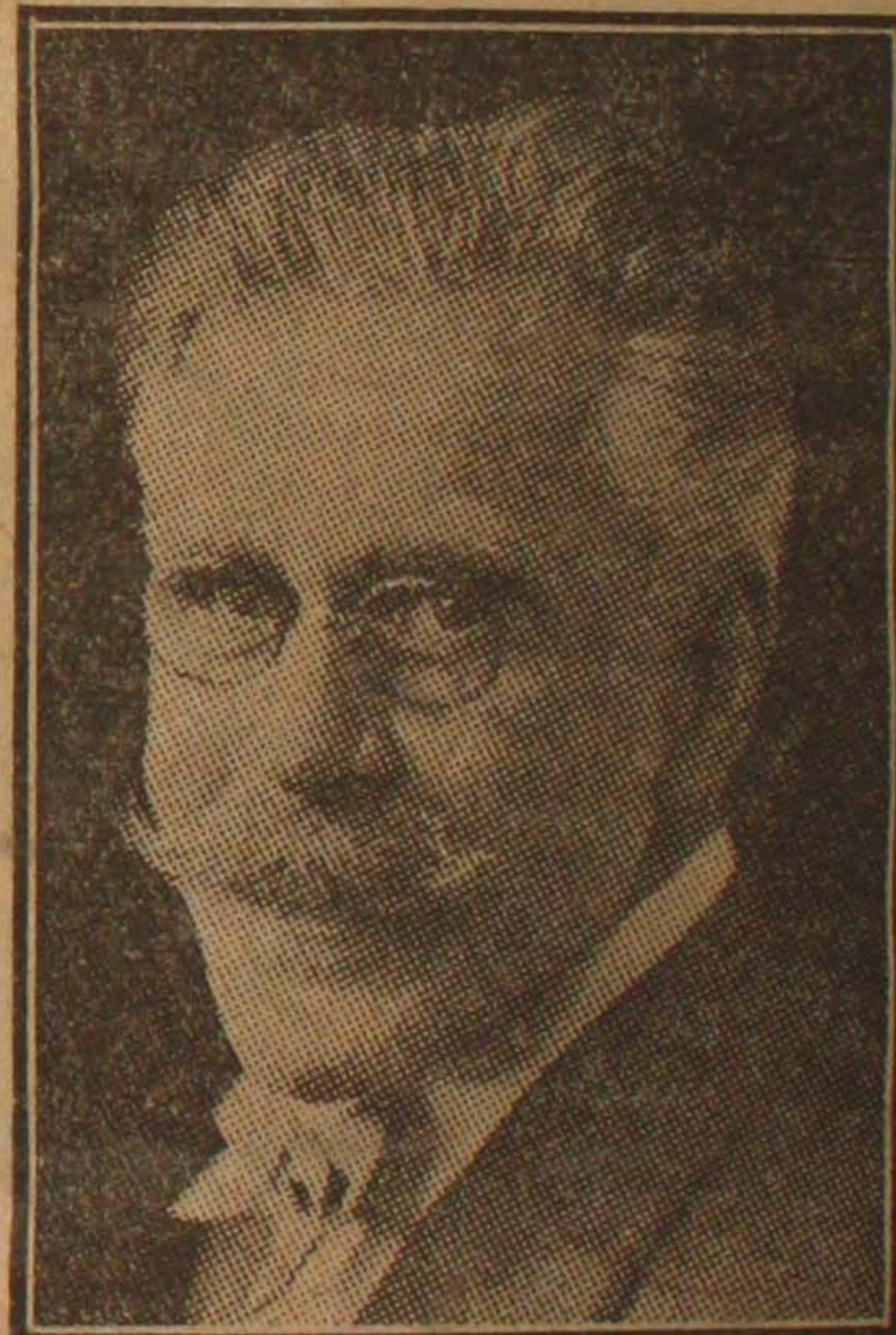
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## MR. CHARLES SCHILSKY.

### RESIGNATION FROM CONSERVATORIUM.

### PROPOSED VISIT TO EUROPE.

Mr. Charles Schilsky, who has been for some years teacher of violin at the Elder Conservatorium, has submitted his resignation to the University Council. It is understood that he proposes to go back to Europe. Mr. Schilsky is extremely



Mr. Charles Schilsky.

popular with the students and staff at the Conservatorium, and is known to many people outside as a fine artist and a teacher of ripe experience. His resignation was considered by the council at its last meeting, and it is understood that it was accepted with regret. Latterly Mr. Schilsky has not enjoyed the best of health, and the strain of greatly increased work at the Conservatorium has made a long-deferred holiday necessary.

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### ENGLISH EXAMINATIONS.

On Saturday morning a meeting of teachers from public and private schools met Sir Archibald Strong, professor of English at the University of Adelaide, to discuss with him representations which had been made regarding the large number of failures in English at the last leaving certificate examinations. Sir Archibald addressed the delegation, and the teachers submitted their views, after which it was announced that a satisfactory understanding had been reached. Mr. J. G. McDonnell, of St. Peter's College, who convened the meeting, will make a full report to teachers prior to Mr. R. C. Bald's lecture at the University at 5 o'clock on Wednesday afternoon.