

preliminary problems must be settled. Prof. MacDougall, in his very interesting work on Social Psychology, points this out quite clearly. We do not know enough about the complex actions and interactions of communities of men to be able to frame laws with any permanent claims to value. The fringe of the subject only has been touched. More work upon strictly scientific lines is needed.

Until the scientific spirit has thoroughly penetrated the body of the people, until they have learned to think without prejudice, to disregard authority unbacked by reason, and to be critical in their examination of evidence,

social reform must necessarily be a slow and halting process.

This is one reason why the dissemination of simply written accounts of scientific work is to be encouraged. We cannot all spend years in scientific study, but that is no reason why we should not largely share the advantages that a scientific training gives. It is possible to present all the great theories and results of science in a precise and accurate manner, which is nevertheless simple enough to be understood by the average man. Such simple accounts, if sincerely and competently done, are capable of benefiting humanity to a greater extent

than many highly technical and recondite papers enshrined in various "Proceedings" will ever do. Some branches of science are necessarily technical. Mathematical work would be unendurably prolix were the conventional shorthand not adopted, but nearly every other branch of science can be simply and clearly expounded in a non-technical fashion.

When this is done on a large scale, when the ordinary man tries to keep *au fait* with scientific work as naturally as he does with politics, murders and divorces, the result will prove that the value of science is something which cannot be overestimated.



The Hughes Gold Medal of the Royal Society of London

Award to Dr. Alexander Graham Bell

By T. E. James



DR. A. GRAHAM BELL, LL.D., the distinguished inventor and physicist, has been awarded the Hughes medal, which is the gift of the Royal Society of London, for his share in the construction of the telephone receiver and invention of the telephone. The medal was founded under the terms of the will of Prof. D. E. Hughes, F.R.S., the inventor of the microphone, who in 1898 bequeathed the sum of £4,000 to the Royal Society, as well as similar amounts to the Institution of Electrical Engineers, London, and the Académie des Sciences, Paris. No restriction of age or nationality was to weigh in the selection of any recipients.

Dr. Bell was born in Edinburgh, Scotland, March 3rd, 1847, son of Alexander Melville Bell, who, in 1870, became a lecturer on philology at Queen's College, Kingston, Ontario, removing in 1881 to Washington, D. C., where he devoted himself to the education of deaf mutes. Graham Bell was educated at Edinburgh

University and London University. Going with his father to Canada in 1870, he, two years later, was appointed a professor of vocal physiology in the Boston University.

Bell for many years was Regent of the Smithsonian Institution in Washington. He has taken an active interest in phonetics, and has invented a machine called the graphophone, allied to the phonograph, for recording and reproducing sound. This instrument has come into use for teaching phonetics in American schools and colleges. In his later years he has experimented on the problem of flying, and has invented special types of man-lifting kites. His inventions and experiments have shown much originality and his scientific contributions, especially to applied science, have great merit.

The tribute paid by the late Sir William Preece, F.R.S., to Bell's services may here be recalled. Writing in 1878, he said: "The phonograph is the outcome of

the articulating telephone. Though several have added their share in perfecting the 'far-speaker,' there is no name in connection with it that will shine with greater brilliancy than that of Alexander Graham Bell. His father's occupation as a vocal physiologist, led him to study the vocal organs and the production of sound. Helmholtz's researches led him to investigate electricity and its application to telegraphy. The desire to increase the capacity of wires for the conveyance of messages led him to devise systems of multiple telegraphy, and this by steady and sensible degrees, led him to articulate telephony. We have a notable example of the modern method of research, where imagination suggests experiment, and experiment by evolution produces growth and perfection. The telephone will always be associated with Bell's name, and it will remain one of the marvels of this marvelous age, while its chief marvel will be its beautiful and exquisite simplicity."

The Glow of Sulphur*

By W. H. Watson

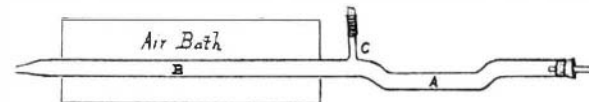
ALTHOUGH not mentioned in the majority of textbooks, the fact that sulphur under certain circumstances exhibits a glow or "phosphorescence" has been frequently recorded. The method of obtaining the glow was described by Berzelius in his "Lehrbuch" (5th edition, vol. i., p. 185), and since then several investigators have turned their attention to the matter, but without arriving at an explanation of the phenomenon. The idea has been suggested that the glow was accompanied by the formation of a lower oxide of sulphur, possibly a monoxide, SO, but attempts to obtain such a body by Heumann (*Ber.* xvi., 139), O. Jacobsen (*Ber.* xvi., 478), and also by the writer, have proved unsuccessful. Experiments upon the oxidation of sulphur at low temperatures by Moissan (*Comptes Rendus*, 1903, xxxvii., 547) also lend no support to the idea. At the suggestion of Prof. H. B. Baker, to whom the writer desires to express his indebtedness, a further investigation of the phenomenon was undertaken with the results set forth below.

In the paper by Heumann referred to above, the author describes various methods of obtaining the glow, the most successful of which appears to be that of placing sulphur on a shallow tray supported above the bottom of an iron air-bath heated to about 240 degrees, and allowing a current of air to pass over the molten sulphur. When the conditions are properly regulated, a large flame, differing in color from the usual blue flame of burning sulphur and also in the fact that it is relatively cold (see also Baker, *Journ. Chem. Soc. Trans.*, 1900, lxxvii., 646), can be obtained and maintained for a considerable time. The author states that the slow combustion is accompanied by a curious smell which he compares to ozone or camphor.

These facts have been confirmed by the present writer, who found that the glow invariably exhibited itself as a curious luminous flicker over the heated base and adjacent parts of the sides of the oven, but never on the surface of the sulphur. Further experiments were made by means of an apparatus similar to that described below.

A piece of glass tubing, 40 to 50 centimeters long and about 1 centimeter bore, was bent as shown in the sketch, and had a narrow side-tube sealed in at C. Some pure re-crystallized sulphur, which had previously been kept melted for some time, was placed in the part A, while B was inclosed in an air-bath kept at 100 to 120 deg. Cent. The sulphur was maintained at about 250 degrees, while a slow current of pure dry air was passed through the apparatus, the side-tube C being closed. So long as the sulphur was kept below its ignition-point, no luminosity could be observed on

the surface of the sulphur, but the air current became charged with a cloud of fine particles which were carried along the tube and not completely deposited before reaching the open end. In the portion of the tube within the air-bath, extending for some centimeters from the end nearer the melted sulphur, a steady glow could be observed, which, however, ceased if by any chance the liquid sulphur became ignited. The glow could be produced at any part of the tube B by heating gently at that part and allowing the rest to remain cool, even when B was of considerable length. By using a mixture of nitrogen and air a somewhat brighter glow was obtained, but the glow completely ceased if pure nitrogen were employed. In this latter case, however, it was possible to obtain a glow by introducing air through the side-tube C. It would therefore seem unlikely that the glow is connected with a preliminary action of oxygen on the heated sulphur.



If the air current after passing over the heated sulphur were filtered through a tube filled with recently ignited asbestos no glow whatever could be obtained in B, but the glow reappeared when the asbestos was removed. Similar results were obtained if cotton-wool or pieces of moist stick potash were used instead of asbestos. Bubbling the air through water was also effective, and a quantity of colloidal sulphur collected in the water.

In another series of experiments the gases escaping from the end of the tube in which the glow was taking place were led through a tube immersed in liquid air. A small amount of solid sulphur dioxide was collected, and in some cases a liquid. This latter, however, contained no sulphur compound other than a trace of sulphur dioxide, as on careful evaporation and bubbling the resulting gas through fuming nitric acid or a solution of potassium permanganate, no sulphuric acid was obtained. The gas contained about 40 per cent of free oxygen, and the residue appeared to be nitrogen and probably some argon. Similar results were obtained if the gases immediately after leaving the heated sulphur, and without allowing the glow to occur, were treated in the same way. In all cases the gas which escaped liquefaction by the liquid air was quite odorless.

There is therefore no direct evidence that an appreciable amount of an oxide of sulphur other than dioxide is formed at any stage. Heumann arrived at a similar conclusion from an analysis of the gases escaping from glowing sulphur. The glow appears to be caused by the oxidation of the particles of finely-divided sulphur resulting from the cooling of the air which has passed over the heated sulphur, and this view is in

harmony with the observations recorded both here and in the records of earlier investigators. If this finely-divided sulphur is the result of some such reactions as the following — $2S + O_2 = 2SO$, then $2SO = SO_2 + S$, the intermediate product must have a merely transient existence, and its presence would not be shown by chemical tests.

The finely-divided sulphur not only undergoes oxidation at a comparatively low temperature, but attacks copper and silver at the ordinary temperature with the production of black films of sulphide. Experiments made in order to discover whether the particles were electrified or not, failed to show the existence of a charge. Air containing the finely-divided sulphur led through a tube containing an insulated piece of copper-foil connected with a delicate electroscope did not discharge the latter, whether the instrument carried a positive or negative charge. In other experiments the stream of finely-divided sulphur passed between two long strips of platinum foil, insulated and connected to opposite terminals of a small induction coil. Some 5 to 10 milligrammes of sulphur deposited on the plates in the course of an hour, but although the amounts deposited on the two plates were generally unequal, the variation was not large, and, moreover, not constant. On the whole, the results obtained were not decisive.

Summarizing the results obtained, it may therefore be stated that when air passes over sulphur heated to a temperature below its ignition-point, the air becomes charged with sulphur vapor, which, as the temperature falls, separates as a mist or cloud of very small particles. The oxidation of this finely-divided sulphur gives rise to the phenomenon of the glow or "phosphorescence," but there is no evidence that at any stage any other oxide than sulphur dioxide is formed.

Indian Corn in the Far East

CONSUL GENERAL ANDERSON, stationed at Hong Kong, calls attention to an economic change of the utmost importance now in progress in the Far East, viz., the introduction of maize as a formidable competitor of the hitherto universal rice. Indo-China and the Philippines have already developed the cultivation of this grain to an extent which has affected international trade in the East and resulted in great benefit to the peoples concerned. Maize has made less rapid progress in China. The cultivation of maize in the Philippines results from an energetic campaign of education on the part of the Bureau of Agriculture. In most parts of the islands two or even three crops can be produced annually. The recent threatened rice famine in the Philippines, which impelled the government to import large quantities of rice and sell it below cost, emphasizes the urgent need of a diversification of the native diet.

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