in the interior of a crystal and its energy passed on, more or less as a complete unit, to the surface.

There are two possible mechanisms by which this transfer might take place. The first is based on the fact that there is little restriction from a *spatial* point of view to the movement of electrons through a crystal lattice. Normally, in non-conducting inorganic crystals the most loosely bound electrons are attached to the negative ions. They cannot move about very much at ordinary temperatures, because more energy than is usually available at this temperature is required to move them from their position. At higher temperatures, of course, most crystals become conducting. When a quantum of light is absorbed by a bromide ion in silver bromide, the electron may be torn from its position and sent to another part of the crystal. There it settles on a silver ion, producing a silver atom. Very little energy is now required to move it from one silver to another, and in an electric field such a movement may readily take place, giving rise to the phenomenon of photoconductivity.

When the electron is removed from the bromide ion, it leaves it as a bromine atom. An electron from a neighbouring bromide ion can readily take the place of the original one, leaving in turn a bromine atom. In other words, the *position* of the bromine atom can move about through the crystal lattice. If it by chance comes to the surface it can, in the case of the photographic plate, readily oxidize an adsorbed gelatine molecule. The silver atom is then stabilized and its *position* moves about until it meets another silver atom, preferably at a surface, where it starts the nucleus of a crystal. This forms the latent image of the photographic plate which, on development, is increased about ten millionfold. Crystals not already having nuclei of silver do not develop in the period of time in which the plate is immersed in a reducing solution. The whole question of the action of a photographic plate is much more complicated than this, but the above mechanism provides a good working hypothesis.

The second important mechanism for the transfer of energy through a crystal does not require even the movement of an electron. According to this, the primary process of light absorption results (as usual) in an electron with a higher amount of vibrational energy, but moving more or less in its original mean position. Such a vibrating electron produces an oscillating electric field which influences neighbouring electrons, and the *energy* of the electron, the 'exciton', is passed on from one electron to another as a complete unit. In this way the exciton 'diffuses' about until it reaches a surface where it may cause a chemical change, or until it reaches a potential radiator where it may result in fluorescence.

There are many examples similar to the photographic plate in which light absorbed in the interior of a crystal leads to a reaction on the surface. Most inorganic oxides, such as zinc, titanium and antimony, which absorb in the near ultra-violet, can cause a photochemical change with certain organic compounds adsorbed on their surface. In no case as yet has it been established whether the transfer occurs by free electron diffusion or by exciton diffusion.

Obituary Notices

Prof. S. L. Loney

SIDNEY LUXTON LONEY, whose death at the age of seventy-nine years occurred on May 16, belonged to the older generation of Cambridge mathematicians, whose training was broad as well as specialized, and his position as third Wrangler in the then undivided Tripos justified the high opinion formed of his abilities at Tonbridge School by his teacher, Mr. Hilary, one of the most remarkable mathematical teachers of his generation.

On leaving Sidney Sussex College, Cambridge, Loney was faced with the choice which so often confronts the ablest young graduates—the choice between the advancement of specialized learning by research, or the advancement and diffusion of sound knowledge by direct teaching. His exceptional gifts of clear exposition and fertility of illustration led him towards teaching, and he devoted himself wholeheartedly to his chosen profession, as professor of mathematics at Royal Holloway College, London. Before the establishment of the internal side of the University of London, many students of Holloway College took the Final Honour Schools of the University of Oxford, and the mathematical class lists of the years 1891–1907 afford evidence of the high standard of mathematics at the College at that time. After the College became one of the internal colleges of the University of London, a correspondingly high standard was maintained in the London honours lists, and this tradition has been continued under his successors, Prof. Jolliffe and Prof. Bevan Baker.

It was during his tenure of the College professorship of mathematics that Loney's text-books on applied and pure mathematics were written; and for nearly fifty years they have been established as

standard text-books, well known throughout the educational world. In addition to these books, he also actually wrote a popular "Arithmetic", although he himself considered that he "knew no Arithmetic".

Besides being a first-rate teacher, Prof. Loney was an excellent man of business, with a genius for committee work; and for many years he was one of the most influential members of the Senate of the University of London. His capacity for strenuous work, his thorough grasp of business, and his intuitive knowledge of men and women, were given full scope during the Great War, when for a considerable time he carried out many of the duties of Principal Officer of the University in addition to his other work. As chairman of Convocation since 1923, and deputy chairman of the Court since 1929, he rendered greatly appreciated services. These services were all the more valuable because of his dual position in the University. As a former professor in one of the internal colleges, he was a warm supporter of the teaching side; on the other hand, he was also an active and enthusiastic representative of the external side; and he was strongly of opinion that there was ample room for both internal and external sides in a great Imperial university, and that harmonious co-operation was the desirable ideal. Now, thanks largely to his efforts and those of other like-minded members of the Senate, this ideal has been to a large extent realized.

After retiring in 1920 from his professorship at Royal Holloway College, Prof. Loney continued to render valuable services as governor and trustee; and he had the satisfaction of seeing the College, with which he had been so long and honourably connected, established in its present position in the University and in the educational world.

E. C. HIGGINS.

Dr. J. G. Lipman

WE regret to announce the death, after a brief illness, of Dr. Jacob Goodale Lipman, the well-known director of the New Jersey Experiment Station, New Brunswick, N.J. Dr. Lipman was born in Friedrichstadt, Russia (now in Latvia), on November 18, 1874, and received his early education first in Moscow and later in the *gymnasium* of Orenburg. In 1888 his family emigrated to the United States and soon settled on a farm at Woodbine, New Jersey. Here he became interested in agriculture and the scientific principles underlying it, and when in 1894 he entered Rutgers College, he came under the influence of Prof. E. V. Voorhees, one of the earlier American leaders in research on soils and fertilizers. He proceeded to Cornell University for advanced training in chemistry and bacteriology, and in 1901 was appointed to the Agricultural Experiment Station at New Jersey in charge of the Department of Soil Chemistry and Bacteriology. Shortly afterwards he was appointed, first instructor and afterwards professor, in agricultural chemistry at the neighbouring Rutgers College. His whole life was spent between the two institutions, and in 1911 he became director of the Experiment Station.

Lipman was one of the leaders in soil bacteriology and the study of fertilizers in the United States, and his writings did much to direct the attention of the public to the need for providing adequate support for studies of these subjects. Among his well-known publications were many reports of considerable technical interest, and in 1908 he published his book "Bacteria in Relation to Country Life".

Lipman was a great organizer and will long be remembered by all who took part in the First International Congress of Soil Science, held in 1927 in Washington, D.C., followed by a special scientific excursion throughout the United States and Canada. The whole Congress was a brilliant success, a model of what such functions should be.

Lipman was also editor of *Soil Science*, a journal which first appeared in January 1916 and owes much of its success to his enthusiastic and devoted labours. He was a man of unbounded kindness and geniality, wise in counsel, and a delightful host; he attracted and kept together a brilliant band of scientific workers and he made the New Jersey Experiment Station one of the leading agricultural institutions in the world. His death removes a great figure from among us.

E. J. R.

Mr. H. E. Wroot

WE regret to announce the death of Mr. H. E. Wroot at the age of seventy-one years.

Herbert E. Wroot went to Yorkshire from St. Albans in 1890 to join the staff of the *Bradford Observer*, with which he was associated for thirty years. He then joined the staff of the *Yorkshire Post* and later became an assistant editor and, until illness overtook him in 1933, he was of great assistance to natural history workers by his knowledge and facile pen; the extent of this work is only known to those who were in touch with him at this time. He joined the Bradford Scientific Society, acting on the council, and as secretary and president.

Mr. Wroot was a member of the executive of the Yorkshire Naturalists' Union, president of its Geological Section and president of the Union in 1929. His address from the chair on "The Pennines in History" (*Naturalist*, 45–60, 105–115; 1930) is proof of his knowledge and interest in the county of his adoption. As a member of the council of the Thoresby Society he contributed a study of J. M. W. Turner's wanderings in Yorkshire. He did much work for the Yorkshire Dialects Society and the Brontë Society.

Mr. Wroot will be best remembered for his work in connexion with Prof. P. F. Kendall, "The Geology of Yorkshire". This work illustrates how a trained journalist, interested in the subject, can place in the reader's hands the knowledge and insight of the scientific worker with whom he collaborates. His reports of the meetings of Yorkshire naturalists and geologists were valued and always eagerly awaited. He enlisted a body of naturalists to aid him in a weekly column of Nature notes, and in these ways his pen greatly helped the local societies and increased their membership and usefulness.