tip. In dog's enamel the fibre axis is at right angles to the surface of the tooth. Variations in the perfection of fibre orientation are observed, and three kinds of enamel can be distinguished. In human teeth it is found that one kind is associated with clinically immune teeth, and the other two with clinically susceptible teeth. Here again the verdict of X-ray analysis must ultimately prove of fundamental importance in the study of living things, and it is to be hoped that this most promising field of investigation will soon be extended so as to take in the effects of the action of vitamins.

The biological implications of recent advances in the X-ray analysis of protein fibres were again dealt with by Mr. W. T. Astbury at the discussion on the structure of protoplasm. No doubt some of the zoologists present were not a little shocked at such heresy, but nevertheless the message of X-rays seems clear enough. The proteins are infinitely variable and adjustable molecular patterns, exquisitely sensitive to changes in physical and chemical environment, and capable of functioning not only as enzymes but also as the material embodiment of the genes. Surely they are no other than the very patterns of life! W. T. A.

News and Views

Honorary Fellows of the Physical Society

THE list of honorary fellows of the Physical Society was lengthened on October 6 by the addition of the names of Profs. F. Paschen, A. Sommerfeld and R. W. Wood. Friedrich Paschen, director of the Reichsanstalt until last year, was born in 1865, and has crowded an immense amount of fundamental work into the intervening years. 'Paschen's law', governing the sparking potential between electrodes, is as familiar as the Paschen series in the line spectrum of hydrogen, whilst the Paschen galvanometer (now nearly forty years old) is still probably the most sensitive yet constructed. These three examples remind us of his versatility, but it has to be remembered that he also measured the heat evolution of radium, investigated the Doppler effect in canal rays, measured a great number of wave-lengths in the ultra-violet and infra-red and, above all, was one of those who established experimentally the form of the spectral distribution curve for a black body.

ARNOLD SOMMERFELD, best known by that encyclopædic summary of the old quantum mechanics, "Atombau und Spektrallinien", is three years the junior of Paschen. He occupies a chair at the University of Munich, and his contributions to knowledge are all mathematical. He has contributed to subjects so diverse as the calculation of the A.C. resistance of coils, and the theory of optical dispersion. In the early days of wireless, he, like most of the mathematical physicists of the time, took part in the discussion on how the waves managed to follow the curvature of the earth. More familiar to students is his mathematical formulation of the intensity due to a wave, regarded as a summation of the effects due to Huygens' wavelets, though his fame rests chiefly on the refinements which he applied to Bohr's theory of the atom, such as the taking into account of elliptical orbits, and the application of a relativity correction to the equations of motion of an electron, thus correctly accounting for the fine structure of the hydrogen lines.

THE third of this distinguished trio, Prof. R. W. Wood, was born in the same year as Sommerfeld, and is, like him, a foreign member of the Royal Society. Professor at the John Hopkins University, scene of the 'Baltimore Lectures', it is fitting that his interests should have centred around wave theory, first in optics and more recently in supersonics. His experimental genius is universally acknowledged, and his textbook on "Physical Optics"—as it must be with such an author—is not only full of facts in all branches of its subject, but also contains a wealth of practical advice. Light filters, the construction of zone plates, the making of a prism with an angle of a few minutes (or was it seconds ?) of arc, all received the same careful attention. Perhaps his greatest single discovery was that of resonance radiation. Great as it was in itself, it came at the right time to help the theoretical physicists to work out the conception of energy levels and quantum transitions in the atom.

Guthrie and the Physical Society

ON October 15 occurs the centenary of the birth of Frederick Guthrie, through whose initiative the Physical Society of London was founded. Born in Bayswater, London, Guthrie was the son of a Bond Street tailor, and as a boy had as tutor the chemist Henry Watts (1815–1884), to whom no doubt he owed his early devotion to science. He was sent to University College School, and afterwards entered University College, where Watts was an assistant professor, and studied chemistry under Graham and Williamson, and mathematics under De Morgan. From London, at the age of twenty-one, he went to Germany, working under Bunsen at Heidelberg and under Kolbe at Marburg. On his return to England he was successively assistant to Frankland at Owens College and to Lyon Playfair at Edinburgh. In 1861 he was appointed professor of chemistry and physics at the Royal College, Mauritius, where he had as his colleague Walter Besant, the novelist. In 1869 he became professor of physics at the Normal College of Science, South Kensington, and this post he held until his death.

GUTHRIE'S early published papers related to chemistry, but in Mauritius he turned to the study of physical problems and afterwards published memoirs and textbooks on heat, magnetism and

electricity and other subjects. Widely known as a gifted and versatile man, it was in 1873 that he issued to his friends a characteristically worded circular which resulted in the formation, early in 1874, of the Physical Society, of which J. H. Gladstone became the first president. The Society soon met with success and in a few years included most of the leading physicists of Great Britain. Guthrie himself became demonstrator to the Society, but in 1884 was elected to the office of president. Two years later he was unfortunately attacked by cancer of the throat and died on October 21, 1886, at the early age of fifty-three years. He had been four times married and after his death a memorial fund was raised for his widow and children; his widow was also granted a Civil List pension. Guthrie was buried in Kensal Green Cemetery. His work for the Physical Society was of the greatest importance and a year or two ago the Guthrie memorial lecture was founded in his honour.

The Science Museum

WE have on several occasions referred to the remarkable developments in recent years of the Science Museum at South Kensington, and the instructive character and arrangements of the collections there. Sixty years ago, a report of the Royal Commission on Scientific Instruction and the Advancement of Science, of which Sir Norman Lockyer was secretary, directed attention to the wide sphere of usefulness that was open to well-devised science collections; and a loan collection of scientific apparatus formed by Lockyer at South Kensington in 1876 was the beginning of the then contemplated "National Collection of the Instruments used in the investigation of mechanical, chemical, or physical laws". For thirty years after, the valuable collections of machines and apparatus were housed in temporary buildings, but the scheme was then revived and in 1909 the President of the Board of Education received a large deputation which urged that it should be put into action. The result was the appointment of a Departmental Committee of which Sir Hugh Bell was chairman, and the adoption of the report of this Committee as the basis for the development of the Museum. The new building was opened by the King and Queen in 1928, and every year sees an increase in the number of visitors and in its sphere of influence. Sir Henry Lyons joined the Museum in 1912 and became director eight years later, and it is through his untiring work and wise guidance that the Museum has become not only a great treasure house of apparatus and machines of historic importance, but also a living record of notable achievements in science and engineering.

Presentation to Sir Henry Lyons, F.R.S.

IT was appropriate, therefore, that at the Museum on October 11, Lord Irwin, President of the Board of Education, should present, on behalf of the Advisory Council, to Sir Henry Lyons, who retired from the office of director on October 9, a writing table and the following address:—"We, your friends, members of the Advisory Council of the Science Museum, wish to express to you, on the occasion of your retirement after holding for thirteen years the position of Director of the Museum, our great regret at the termination of your services and our warm appreciation and admiration of the work which you have done. In 1920 when you were appointed, the Museum was a small Institution known only to a few. The Eastern Block, planned in pre-War days by Sir Hugh Bell's Committee, was incomplete. The Collections, scattered throughout various unsuitable buildings, were without order and arrangement. You had the vision to realize the position the Museum might take and the value it might be to Science and to Industry. By your tact, energy and ability you have made it what it now is and is known to be—a treasure-house of past achievements and an inspiring guide to future progress. One single fact suffices to indicate the magnitude and success of your work: the number of visitors has increased from about four hundred thousand in 1921 to nearly one and a quarter millions in 1932. We claim for the Museum a foremost place among Institutions of its kind, and recognise that it is to you that this is due. You lay down that work with every good wish from all of us for your future happiness and prosperity." The address was read by Sir Richard Glazebrook, chairman of the Advisory Council, and the hope was expressed by several speakers that the promised Central Block of the Museum would soon be available.

Tercentenary of the Observatory of the University of Leyden

THE Observatory of the University of Leyden was founded in 1633 and celebrates its tercentenary this year. Prof. W. de Sitter has written a commemorative brochure which is illustrated by many photographs and reproductions of old prints, and describes the history of the Observatory from its foundation down to the present day (Haarlem: Joh. Enschedé en Zonen). Leyden is not quite the oldest active observatory. The Vatican Observatory was founded by Pope Gregory XIII, the reformer of the calendar, in the sixteenth century. But Leyden is the oldest of the seventeenth century observatories, the others, in order of foundation, being Utrecht, Copenhagen, Paris and Greenwich. Amongst the early scientific workers mentioned by de Sitter is Jacobus Golius, the founder, who was led by the corrupt state of the Greek texts to study the ancient mathematicians in the Arabic; he possessed a very fine Arabic edition of Appolonius, but could not be prevailed upon to publish a Latin translation of it. Actually, the first Latin translation of Appolonius was published by Halley in 1710. Few observations were made at Golius's observatory. For more than a century the observatory was located on the roof of the University, and was maintained as much for instructional as for scientific purposes. As the public had the right to look through the telescopes at any time, the observers were often hindered in their work.

THE Observatory became at times very nearly defunct; Lalande says: "En 1774 je n'y vis ni Astronome ni instrumens que l'on puisse citer."