value, the risk presented to the cell structure is too small and the substance is a non-carcinogen.

The term 'carcinogenic potency' must be interpreted cautiously. Indeed, the relative potency of a carcinogen varies from one cell type to another, and we must qualify the above ideas to cover this point. If the potency of a carcinogen is dependent on the amount of energy liberated during a given time period, it will be directly controlled by the rate of the metabolism of the substance. Other factors which will influence the rate of metabolism of a compound besides ease of adsorption to the enzyme system responsible for the reaction are the ease with which the molecules of the compound can reach that system, and the ease with which the reactants can be desorbed and removed from it to allow for further reaction. These properties will depend on the precise spatial configuration of the molecule of the carcinogen and of the cell structure, and on the intimate interactions between these. It follows that differences in cell structure will affect the rate of metabolism of the carcinogen; it is inferred that they will thus affect the potency of the carcinogen.

[1] Cook, J. W., and Kennaway, E. L., *Amer. J. Cancer*, **39**, 398 (1940).
[2] Haddow, A., *Brit. Med. Bull.*, **4**, 331 (1947).
[3] Berenblum, I., and Schoental, R., *Cancer Res.*, **3**, 148 (1943).
[4] Figge, F. H., *Cancer Res.*, **6**, 498 (1946).
[5] Weigert, F., 23rd Ann. Rep., Brit. Emp. Can. Campaign, 77 (1946).
[6] Trautz, M., *Z. physikal. Chem.*, **53**, 1 (1905).
[7] Eckhardt, H. J., *Ber. deutsch. chem. Gesellsch.*, **73**, 13 (1940 B.).
[8] Fieser, L. F., "Production of Cancer by Polynuclear Hydrocarbons". (Univ. of Pennsylvania Bicentennial Conference, Philadelphia, 1941.)
[9] Milas, N. A., and Sussman, S., *J. Amer. Chem. Soc.*, **58**, 1302 (1936).
[10] Bielschowsky, F., *Biochem. J.*, **39**, 287 (1945).
[11] Stevenson, E. S., Dobriner, K., and Rhoads, C. P., *Cancer Res.*, **5**, 235 (1942).
[12] Peacock, P. R., *Glasgow Med. J.*, **127**, 157 (1937).
[13] Peacock, P. R., *Cancer Res.*, **6**, 311 (1946).
[14] Rous, P., *J. Exp. Med.*, **69**, 399 (1939).
[15] Berenblum, I., and Schoental, R., *Cancer Res.*, **6**, 703 (1946).
[16] Cook, J. W., *Ann. Rep. Chem. Soc.*, **39**, 155 (1942).
[17] Höber, R., "Physical Chemistry of Cells and Tissues", 391 (Churchill, 1945).
[18] Pullman, A., and Pullman, B., *Rev. Sci., Paris*, **84**, 145 (1946).
[19] Schmidt, O., *Z. physikal. Chem.*, (B), **42**, 83 (1939).
[20] Schmidt, O., *Z. physikal. Chem.*, (B), **44**, 194 (1939).
[21] Daudel, R., *Rev. Sci., Paris*, **84**, 37 (1946).
[22] Weiss, J., *J. Chem. Soc.*, 245 (1942).
[23] Weiss, J., *Nature*, **147**, 512 (1942).

OBITUARIES

Prof. P. Lenard

Philipp Lenard was born at Pozsony (Pressburg) in Hungary on June 7, 1862. In the town of his birth he was fortunate in finding an excellent teacher of physics, Virgil Klatt, in conjunction with whom he later carried out his first work on phosphorescence. As a young man he studied physics at the Universities of Budapest, Vienna, Berlin and Heidelberg under, among other famous teachers, Bunsen, Helmholtz, Königsberger and Quincke, obtaining a thorough all-round knowledge of theoretical as well as experimental physics. His first senior appointment was, in fact, as professor of theoretical physics in Heidelberg in 1896; two years later he was made professor of experimental physics at Kiel, where he remained until recalled to Heidelberg in 1907 to be Quincke's successor as professor of experimental physics. In 1909 he was made in addition director of the newly founded Radiologisches Institut, which was more or less amalgamated with the physics research laboratory of the University. He remained as professor at Heidelberg until his retirement in 1931. News has recently reached England of his death on May 20, 1947.

Lenard's first paper was on the vibrations of water drops, recalling the fact that Bohr's first paper was the determination of the surface tension of water by jet vibration, and his researches covered a wide field, but he is best known by his pioneering work on cathode rays and electron physics in general. Hertz, whose assistant he was at the time, had shown in 1892 that cathode rays would pass through thin metal foils. Lenard followed this up, and in 1893 succeeded in making a cathode ray tube with a very thin vacuum-tight metal window, with which he obtained outside the generating tube a beam of cathode rays which could either be passed through gases or solids, or be tested in the highest attainable vacuum. His systematic experiments on the passage of cathode rays through matter showed that the absorption was roughly proportional to the density and, further, that it decreased very rapidly with increasing velocity of the rays. He proved that cathode particles of high energy could pass right through atoms, and explained this by his theory that the positive and negative changes within the atom were grouped in tight couplets, which he called 'dynamids'. This theory was, of course, shown to be untenable by Rutherford, but nevertheless Lenard was the first to insist on the charges being grouped so that the space within the atom was relatively empty and penetrable by fast particles. Lenard was the first to prove that the negative electricity released in the photo-electric effect consisted of electrons, although J. J. Thomson's independent demonstration appeared very soon after. For his work on cathode rays he was awarded the Nobel Prize for Physics in 1905.

Lenard was also a pioneer in the field of ionization potential, being the first to show that an electron must possess a certain minimum energy before it can produce ionization. His earliest estimate of 11 volts as the ionization potential of hydrogen, nitrogen and oxygen was a very good one for the rough methods then available. His original experimental disposition was the pattern for many subsequent methods. Another field in which Lenard carried out fundamental work was phosphorescence. First of all in conjunction with Klatt, and later alone and in conjunction with Wilhelm Hausser and others, he studied in great detail the preparation, excitation and emission of light with the alkaline earth and zinc phosphors. In these investigations it was established that the light emission was due to small traces of foreign metal in the sulphide, for example, calcium sulphide, which constituted, with a flux, the bulk of the material, and Lenard put forward the theory that the excitation involved the removal of an electron from the metal atom, which electron was held in certain ways in the surroundings until subsequently released, when its return to the metal atom caused light emission. This is the general basis of the theory now accepted. He also established experimentally that the process was of a quantum nature and, in general, laid the basis for the precise quantitative study of the subject.

He carried out important work in many other directions. He worked out the method of measuring magnetic fields by the bismuth spiral, his work on the electrification caused by splashing was important in its time and he was actively concerned with the electrical properties of flames. Mention must also be made of the important body of work which he carried out, mainly in conjunction with Ramsauer, on the ionization produced by ultra-violet light, which is not known as widely as it might be.

Lenard was personally a difficult man, whose character contained many contradictions. An intimate friend of mine who knew him well once wrote to me : "Was Lenard betrifft, so ist er so klug und so dumm wie immer". He was profoundly disappointed not to have discovered the Röntgen rays, which he had almost under his hand and would have in all probability found within a year or so of the actual date if Röntgen had not anticipated him. He never used Röntgen's name in referring to the rays. He took as a personal affront any inadequate acknowledgment of his work and was incapable of any generosity or even justice towards anyone who, in his opinion, had failed to appreciate any part of his services to science. Although he owed much of his success to Jews, for example, Hertz and Könisberger, and at one time freely acknowledged the debt, he became a bitter anti-Semite and even treated Einstein as not far from an impostor. He refused to fly the Institute flag at half-mast when Rathenau was murdered and was with difficulty saved from popular indignation. He became a whole-hearted supporter of the Nazi regime and of the 'German physics' movement: in fact, he wrote a book called "Deutsche Physik". Yet he had a kindly side to his nature and was often a pathetic rather than a menacing figure. He possibly felt a deep personal need of friendship which he was unable to win or, if he could win it, to retain. His lack of trust in others, his failure to awaken the self-reliance or sympathy of those working under him were the cause that he did not found a great school of physics. It has been suggested, probably correctly, that the clue to his character was that he was a weak personality that sought to protect itself by a hard shell.

As an experimental physicist, Lenard was certainly one of the greatest figures of his time. His work on the physics of the electron was distinguished by a masterly experimental technique and his discoveries had a profound influence on the course of physics, in particular his work on the release of electrons by electron impact and by light. Yet he seemed fated never to achieve supreme greatness. He missed the discovery of Röntgen rays ; he came near to the discovery of the true structure of the atom, but just went astray, and his work on light emission was the first to indicate the important part which the release and return of the electron played, but left to Bohr the great advance. He was a whole-hearted enthusiast for experimental physics, whose appreciation of the great men of science of the past times was generous and informed, as can be seen from his book "Grosse Naturforscher" (translated into English under the title "Great Men of Science"). He was a dark genius beclouded by strong personal fears, doubts and envies, but undoubtedly a genius and one who has left an abiding impression in physics.

E. N. da C. Andrade

We regret to announce the following deaths :

Dr. C. C. Hurst, of Cambridge, known for his pioneer work in genetics, on December 17, aged seventy-seven.

Sir Bernard Spilsbury, honorary pathologist since 1934 to the Home Office, on December 17, aged seventy.

Mr. Benjamin Talbot, Bessemer medallist in 1908 and president in 1928 of the Iron and Steel Institute, on December 16, aged eighty-three.

NEWS and VIEWS

Committee on Industrial Productivity

In answer to questions in the House of Commons on plans for further development of scientific research to assist industrial production, Mr. H. Morrison, Lord President of the Council, stated on December 18 that he is advised that, while a major contribution to industrial productivity cannot be expected in the short run from current research in the natural sciences, there are considerable possibilities of increased returns, first from the more widespread application of research already carried out in the natural sciences and technology, and, secondly, from current research in the social science field. He had, therefore, decided, in consultation with the Chancellor of the Exchequer, to supplement the work of the Advisory Council on Scientific Policy by setting up a new Committee on Industrial Productivity. The terms of reference of the Committee are: "To advise the Lord President of the Council and the Chancellor of the Exchequer on the form and scale of research effort in the natural and social sciences which will best assist an early increase in industrial productivity, and further to advise on the manner in which the results of such research can best be applied". The main work of the Committee, of which Sir Henry Tizard will be chairman, will be conducted through a number of panels constituted from time to time to investigate and report on various aspects of the problem. In the first instance panels are being set up to deal with technology and operational research under the chairmanship of Sir William Stanier ; import substitution, under Prof. S. Zuckerman ; the human factors affecting industrial productivity, under the chairmanship of Sir George Schuster ; and technical information services, under the chairmanship of Dr. Alexander King. The remaining members of the Committee will include one or more employers (chosen in consultation with the F.B.I. and the B.E.C.) ; one or more trades union members (chosen in consultation with the T.U.C.) ; Sir Edward Appleton ; Sir Claude Gibb ; Mr. Hugh Weeks ; Mr. Robert Hall ; Mr. E. M. Nicholson ; Mr. G. B. Blaker ; secretary, Mr. E. D. T. Jourdain.

'Flying Wing' Aircraft

Information has just been released that an aircraft of the 'flying wing' type has completed its trial flights at Bitteswell Aerodrome, near Rugby. It is known as the *A.W.*52, built by Messrs. Armstrong Whitworth to the designs of Mr. J. Lloyd, their chief designer. The aircraft embodies two fundamental principles that have developed out of the general progress of aerodynamic research. The abolition of the tail has long been an ideal to some schools of thought. It sets up considerable drag and does not contribute to the performance of the machine, but is necessary for