the experiment he proposes to conduct. This is discussed and, if the proposal is of scientifically grounded interest and the author is sufficiently qualified, he is given the opportunity to do his work." Not more than two or three outside workers can be accommodated at the same time without disorganizing the main work of the Institute. So far there have been more suitable applications than could be accommodated.

These guests form a vital link with other institutes, for not only is a knowledge of the work of the Institute for Physical Problems spread by them but also the guests keep the Institute informed of what is being done elsewhere. Prof. Kapitza is no believer in isolation, as the following passage shows. "In the future similar vital contacts must be established with scientists in other countries. Scientific workers from abroad visited us during the first years of the existence of our Institute. But in recent years the political situation has grown so complicated, that though there were those who wanted to come here, our connections with foreign countries had been severed, so we can only speak of this aspect of our relations with foreign scientists in view of plans for the future. But these relations must, of course, be deemed a normal and sound condition of the work of any academic institute, because science throughout the world comprises one indivisible whole."

Another function of the Institute is to train scientific workers. Prof. Kapitza was not satisfied with the external method of selecting postgraduate students. "Only the institute itself can train its future personnel, and it must do so with great diligence, by gradually nurturing them from youth." The method of selection used for two or three years before the War gave unique opportunities to students at the University of Moscow. "Taking advantage of the fact that we possess greater amounts of liquid helium for experiments at low temperatures than the refrigerating laboratories of the whole world put together, we were in a position to set up a practicum at the institute, which is attended by every student of the Moscow University School of Physics." At first, only the best students were admitted; but later every student was allowed to do two or three experiments, using liquid helium for the study of such phenomena as supraconductivity and magnetic properties near 0°A . The best of the students, if they wished, were allowed to do more than the three experiments, and from the beginning of their third or fourth university year were in close contact with the Institute. Later they were invited to help with the research work as junior laboratory assistants. Prof. Kapitza thinks that if the scheme had not been interrupted by war, probably one out of ten or fifteen of these students, on completing their graduate work, would have proved sufficiently talented to remain on the main scientific staff of the Institute.

"This method of observing young students from the time they are at the university, the thorough and constant verification of their abilities is, in my opinion, the only correct way of selecting young scientific workers, so far. . . . As you grow older, it is only young people, only your pupils, who can save you from premature mental staleness. Of course, every pupil must know more about the field in which he is working than his teacher. And who teaches the teacher, but his pupils? Thanks to his experience the teacher supervises the general fund of the work, but he is taught by his pupils, who deepen his knowledge and extend his scope." The difficulty of making

correct statements about the human being doing creative work is illustrated by Kapitza's statement that "without pupils the scientist very soon dies as a creative unit and ceases to advance". Faraday had no pupils. Rutherford told Kapitza that "it is only because of my pupils that I, too, feel so young". Prof. Kapitza ends the first section of his address with the words "as I myself am approaching old age, I feel that intercourse with youth must be the *modus vivendi*, safeguarding one from withering away and insuring the maintenance of courage and interest in all that is new and advanced in science. Conservatism in science is worse than premature death to a scientist; it acts as a brake on the development of science."

W. H. GEORGE.

OBITUARIES

Dr. G. D. Bengough, F.R.S.

DR. GUY DUNSTAN BENGOUGH, whose name is particularly associated with research on the corrosion of metals, died in the East Sussex Hospital, St. Leonards, on January 20. He was born in 1876, the son of Major E. B. Bengough, and was educated at Malvern and at Selwyn College, Cambridge. He then studied metallurgy at the Royal School of Mines and worked for a short time at the Royal Mint, gaining experience in research under Sir William Roberts-Austen. He went to Burma for practical experience in the extraction of gold and tin ores, and then held teaching posts in the Universities of Birmingham and Liverpool.

While at Liverpool, Bengough published papers on the rupture of metals at high temperatures, in which he showed that the normal fracture through the crystals of a metal gave place to one passing between the crystal grains when a certain critical temperature was exceeded. This he attributed to the presence between the grains of a non-crystalline layer, having some of the properties of a glass, being rigid at low and viscous at high temperatures. The same idea was suggested independently by Dr. Rosenhain, and this conception of an 'amorphous intercrystalline cement', although questioned by some, became popular, and long served as a basis for research.

It was while at Liverpool that Bengough began work on the corrosion of metals, especially brass marine condenser tubes, for the Institute of Metals. A series of reports was issued, in which the conditions determining general corrosion and pitting were examined, and new experimental methods were devised. The work was interrupted by the War of 1914-18. Bengough obtained a commission in the Royal Artillery, and in 1916 was captain and adjutant. He was, however, seconded for work for the Admiralty and later for the Royal Flying Corps, and continued work on corrosion in the Royal School of Mines. He later became a principal scientific officer in the Chemical Research Laboratory at Teddington, and from then onwards devoted himself to the investigation of corrosion, giving special attention to the design of apparatus.

In 1926 Bengough devised the method of anodic protection of aluminium and its alloys which proved of very great industrial value. Not only did the film produced by his method give a high degree of resistance to corrosion, but also it could be given a definite degree of porosity, so that the surface could be made to take dyes or pigments, opening up a wide field of

decorative work. He was also responsible for a method of protecting magnesium and its alloys by depositing selenium, which, however, had certain practical disadvantages.

Much of Bengough's later work was done for the Joint Corrosion Committee of the Iron and Steel Industrial Research Council and the Iron and Steel Institute, and after retiring from Teddington in 1936, he continued to act as consultant to that body and to the Department of Scientific and Industrial Research, being chairman of the Marine Corrosion Sub-Committee.

Bengough's work was marked by a high standard of accuracy. He devised methods by which extraneous factors were so far as possible excluded, so that the results were reproducible. By using carefully designed apparatus, he determined the course of the corrosion process by measuring the absorption of oxygen and when necessary the evolution of hydrogen, so that characteristic corrosion-time curves could be drawn. Such carefully selected conditions cannot, of course, reproduce those of attack on a ship's plate or a condenser tube, and the relations between laboratory results and practical experience have been the subject of much controversy. Bengough laid most stress on the properties of the products of corrosion in determining its subsequent course, whereas Dr. U. R. Evans and his collaborators attached chief importance to the principle of differential aeration. The two investigators were approaching the problem from different angles, and their views were less irreconcilable than they had seemed at first, so that in 1938 a joint statement was issued which showed how great was the measure of agreement. A series of six papers by Bengough and his colleagues in the *Proceedings of the Royal Society*, of which he was elected a fellow in 1938, contains an account of a long series of quantitative experiments on corrosion. Other laboratory work is described in the reports of the Corrosion Committee published by the Iron and Steel Institute, and here his chief service was that of laying down the conditions which must be observed in making standard tests of corrodibility.

Tall and military in appearance and seemingly robust, Bengough had long periods of serious illness before that which led to his death. He was a good chairman and always showed good temper and courtesy in dealing with a notoriously controversial subject.

Dr. Bengough married Constance Helen, daughter of Lieut.-Colonel Jelf-Sharp, who survives him.

C. H. DESCH.

Prof. V. I. Vernadsky

PROF. VLADIMIR IVANOVICH VERNADSKY, one of the leading mineralogists and geochemists in the U.S.S.R., died on January 6. He was born at St. Petersburg on March 12 (February 28, Old Style), 1863. After graduating at the University of St. Petersburg in 1886, he spent some time in Paris working in the laboratories of Le Chatelier and Curie, and in 1896 was appointed professor of mineralogy at the University of Moscow. In 1906 he was elected a member of the Russian Academy of Sciences.

Prof. Vernadsky's early work was devoted to a chemical study of aluminosilicates, a subject which he later expanded and applied in a wider field of the structure of silicates and especially of kaolinite, feldspars and chlorites. At the same time he was

working on descriptive mineralogy and he described and named a number of new minerals. In his lectures at the University he began to break new ground by stressing the genetic aspect in mineralogy. This genetic approach to mineralogy was fully developed in his books: "Essay on Descriptive Mineralogy" (1908, 1910) and "History of Minerals of the Earth's Crust" (1925, 1933). Eventually genetic mineralogy overstepped its proper boundaries and became merged in the far wider field of geochemistry. Thus Vernadsky may be considered the founder of the new Russian school of geochemistry, which has made such gigantic strides during the last three decades.

The greater part of Vernadsky's work on geochemistry appeared in the form of numerous papers, but a good presentation of it may be found in his book "La géochimie", published in French in 1924. It is a most stimulating book, full of daring ideas and wide generalizations. But even more daring is his book "La biosphère", published in 1929, in which he made an attempt to incorporate biological processes into his general scheme of geochemistry.

Endowed with a versatile genius and full of tremendous energy and enthusiasm, Vernadsky spread his activities far and wide. He organized regular research in mineralogy and geochemistry, helped to establish the Mineralogical Museum in Moscow, promoted the establishment of numerous scientific institutions—such as the Biogeochemical Laboratory, the Radium Institute, a permanent committee for the study of meteorites, and others. He was also the founder and the first president of the Ukrainian Academy of Sciences. Vernadsky was well known outside the U.S.S.R. Since 1920 he spent some years in Paris and Prague working and lecturing. He was a member of the Paris Academy of Sciences and the Czechoslovak Academy. He visited Great Britain in 1923, when he took part in the meeting of the British Association in Liverpool.

Vernadsky's direct contributions to science are considerable, but they are dwarfed by the greater importance of his influence on the development of new ideas in geochemistry and mineralogy. As a teacher he was most stimulating. He could easily divert the wealth of his erudition into fresh channels and mark out new lines of research. He was greatly admired and loved by his pupils and colleagues, even by those who violently opposed his views.

A bibliography of Vernadsky's works up to 1936 was given in the 'Vernadsky Jubilee Volume' published by the Academy of Sciences of the U.S.S.R., two articles in *Bull. Acad. Sci. URSS., Géol. Sér.*, No. 1 (1944), one by D. P. Grigoryev (p. 25) and the other by V. G. Kryzhanovskiy (p. 35) give an account of his work, and a short account of the development of geochemistry in the U.S.S.R. has appeared in *Nature* (154, 814; 1944). S. I. TOMKEIEFF.

WE regret to announce the following deaths:

LORD DAWSON OF PENN, P.C., G.C.V.O., K.C.B., president during 1931–38 of the Royal College of Physicians, on March 7, aged seventy-nine.

Prof. F. W. Eurich, emeritus professor of forensic medicine in the University of Leeds, known for his work on anthrax, on February 16, aged seventy-seven.

Sir Duncan Wilson, C.V.O., C.B.E., until 1940 chief inspector of factories (Home Office), and secretary during 1918–30 of the Industrial Health Research Board, on March 1, aged sixty-nine.