sites and zoonoses. (2) "Non-communicable Diseases", that is, cancer, cardio-vascular, intestinal and rheumatic diseases. (3) "Public Health Practice". (4) "Human Biology and Pharmacology", including sections on immunology; the biological standardization, efficacy, and safety of drugs; human reproduction and genetics (the last-mentioned being the subjects of two recently published issues of the *Technical Report Series*, No. 280† and No. 282‡). (5) "Environmental Health", under which are included the control and resistance of insect and molluscal vectors and their resistance to insecticides and molluscicides.

Annexes to the report by the director-general give the names of the members of the Organization's Inter-

national Advisory Committee on Medical Research; details of the meetings of the Organization's Scientific Groups and other research meetings; information about its co-operative research projects and about grants awarded to workers in various countries and the subjects for which the grants were given; as well as information about the Organization's Reference centres and collaborating laboratories in various countries. G. LAPAGE

† *Technical Report Series*. No. 280: *Biology of Human Reproduction*—Report of a WHO Scientific Group. Pp. 30. (Geneva: World Health Organization; London: H.M. Stationery Office, 1964.) 1 Sw. franc; 1s. 9d.; 0.30 dollar.

‡ *Technical Report Series*. No. 282: *Human Genetics and Public Health*—Second Report of the WHO Expert Committee on Human Genetics. Pp. 38. (Geneva: World Health Organization; London: H.M. Stationery Office, 1964.) 3 Sw. francs; 5s.; 1 dollar.

THE WORLD FEDERATION OF SCIENTIFIC WORKERS

THE *Charter for Scientific Workers and the Constitution of the World Federation of Scientific Workers*, which was formulated soon after the foundation of the Federation in 1946, has now been re-issued in order to make the work of the Federation more widely known*.

The Federation claims to be the only considerable organization promoting co-operation between representatives of both the East and the West which has survived the rigours of the 'cold war'; it now represents more than 200,000 scientific workers in some 30 States.

The *Charter* first affirms the responsibilities of scientific workers: (1) to science, in promoting the integrity of scientific work and resisting the suppression or distortion of scientific knowledge, by full publication of results, co-operation with other scientific workers regardless of racial or national barriers, and by securing the growth of science with due regard to the balance between fundamental and applied science; (2) to the community, by studying the implications of science, by endeavouring to ensure that all knowledge is widely understood and used, and by searching for new ways of utilizing scientific knowledge, especially in fighting famine and disease and in improving conditions of life and work, as well as by studying all aspects of public administration so as to ensure that scientific methods are fully used; (3) to the world, by maintaining the international character of science, by studying the underlying causes of war, by assisting agencies seeking to prevent war, by building stable bases for peace, by working against the diversion of scientific effort in preparation for war, and by resisting movements inspired by anti-scientific ideas. Secondly the *Charter* is concerned with the state of science and scientific workers in securing that science is adequately financed, that results of research are rapidly developed and applied, that research is planned to take into account the intrinsic developments of fundamental science, that

the needs of communities are scientifically assessed, and that it is ensured that scientific workers participate actively in the formulation of policy at all levels. Thirdly, the *Charter* is concerned with the opportunities of becoming a scientific worker, including secondary education and university education, and opportunities for part-time studies. Fourthly, it is concerned with facilities for employment of scientists; fifthly, their conditions of work; sixthly, the organization of scientific work, and, finally, the special needs for science in under-developed countries.

Accordingly, the *Constitution* details the aims of the Federation as being to promote understanding and co-operative action between member organizations in assisting it and its constituent members: (a) to work towards the fullest utilization of science in promoting peace and welfare of mankind and to ensure especially that it is applied to help solve the urgent problems of the time; (b) to promote international co-operation in science and technology, particularly in close collaboration with the United Nations Educational, Scientific, and Cultural Organization; (c) to encourage the international exchange of scientific knowledge, and of scientific workers; (d) to preserve and encourage the freedom and co-ordination of scientific work both nationally and internationally; (e) to encourage improvements in teaching science and to spread as far afield as possible the knowledge of science and its social implications; (f) to achieve a closer integration between the natural and social sciences; (g) to improve the professional, social, and economic status of scientific workers; (h) to encourage scientific workers to take an active part in public affairs, and to make them more conscious of, and more responsive to, the progressive forces at work within society. Membership of the Federation is open to any organization of scientific workers or any group of such organizations in any country, subject to meeting the definitions of scientific workers and qualifications given in the appropriate clause of the *Constitution*.

* *Charter for Scientific Workers and Constitution of the World Federation of Scientific Workers*. Pp. 15. (London: World Federation of Scientific Workers, 1964.)

PROGRESS IN CONCRETE RESEARCH

REFERRING to the activities of the Cement and Concrete Association in his introduction to the report for 1963*, the Hon. Leo Russell, director-general of the Association, stresses particularly the decision of its member companies to increase the income of the Association during that year, made necessary not only by rising costs but also to allow for considered expansion of important projects in the field of concrete research. "Apart

from enabling the Association to carry out more effectively the work to which it is already committed, the increased resources will make it possible to undertake some much needed new research and development work".

The report is impressive in its survey of the many research problems and development schemes present in the 1963 programme. In the research section, the subjects include: the constitution of anhydrous cements and cement minerals; reactions in the system $\text{CaO}-\text{SiO}_2-\text{H}_2\text{O}$; cement hydration; problems in chemical analysis;

* Cement and Concrete Association. Report for the year 1963. Pp. 108. (London: Cement and Concrete Association, 1964.)

damping capacity of concrete; concrete strength testing; problems associated with excessively high water/cement ratios; high-strength concrete; fineness of cement; methods of measuring workability. The section on research on the design of structures is noteworthy for its treatment of model testing of structures such as bridges (Manchester Skyway Bridge) and buildings (Metropolitan Cathedral at Liverpool). A further section of the report deals with research on methods of construction. In this connexion: "One of the most interesting experiments recorded . . . is the construction of a length of B 6247 in Lancashire as a trial to examine the effects of the omission of expansion joints. Observations and measurements on this project are continuing, but early results suggest that the development of stress in the concrete indicates little difference between sections with and without expansion joints".

The section of the report on information services provided by the Association is fully comprehensive. These include: education; library facilities; publications; liaison with Press, radio and television; films; exhibitions; organized visits; lectures and discussion meetings. In the matter of library facilities, there has been recently issued a *Catalogue of Publications of the Cement and Concrete Association currently available for Distribution in the United Kingdom*†. This is an informative and valuable publication and should be in the possession of all concerned with the Association's literature on cement and concrete. It lists the following titles (among others): advisory booklets and leaflets; prestressed concrete; roads and road bridges; concrete as a material; technical memoranda; library abstracts; translations; Cement and Concrete Association reprints; bound volumes (for sale); research reports. Many of these publications are available for free distribution; those to be purchased are clearly so marked.

Recently, there has also been published an important booklet entitled *The Flexural Strength of Plain Concrete: Its Measurement and Use in Designing Concrete Mixes*, by P. J. F. Wright‡. Fundamentally the thesis here presented is that usually the quality of concrete is judged by its crushing strength, less attention being directed to the functions of tensile and flexural strength. Where failures in concrete roads occur, it is argued, these generally arise from tensile stresses. A critical examination of the flexural strength of concrete has accordingly been made, based on a great deal of small- and large-scale experimental work. Writing in the foreword to this publication, Sir William Glanville, director of road research, says: "A study was first made of methods of testing. This led to the introduction of a British Standard method for flexural testing. Using this standard test, the strength of a range of concrete mixes was investigated. The type of aggregate proved to be important. A section of the paper describes the way in which the data obtained may be used in designing concrete mixes and compares mixes based on compressive and flexural strength requirements". It is pointed out that the use of flexural strength of concrete for specification and control purposes has not as yet been widely adopted in road construction in Britain, but there is little doubt that the data recorded in this paper will be closely examined by highway engineers and others concerned with design and durability, and failures, of concrete roads.

H. B. MILNER

† *Catalogue of Publications of the Cement and Concrete Association currently available for Distribution in the United Kingdom*. Pp. 40. (London: Cement and Concrete Association, 1964.)

‡ Department of Scientific and Industrial Research: Road Research Laboratory. Road Research Technical Paper No. 67: *The Flexural Strength of Plain Concrete—Its Measurement and Use in Designing Concrete Mixes*. By P. J. F. Wright. Pp. iv + 52 + 4 plates. (London: H.M.S.O., 1964.) 4s. 6d. net.

SONIC INVESTIGATIONS ON INTERNAL DAMPING IN SOLIDS

A SYMPOSIUM entitled "Sonic Investigation on Internal Damping in Solids" was held at Imperial College, South Kensington, during August 6–8, 1964. It was organized by the Acoustics Group of the Institute of Physics and the Physical Society, and sixteen speakers contributed papers.

It is some thirteen years since the last symposium on this subject was organized jointly by the Physical Society and the Institute of Metals¹. The gap of thirteen years, far from representing lack of interest in the subject, rather indicates that papers concerning it are often relevant in other contexts. For example, the International Conference² on Crystal Lattice Defects, held in Tokyo in 1962, included seventeen papers on internal damping. In the present symposium, besides measuring techniques, such matters as the influence of third-order elastic constants on apparent internal damping, the effects of microcracks and structural changes on the damping of ceramics and the choice of rubbers for highly efficient shock absorbers were discussed.

In the thirteen years since the last internal damping conference in London, interest has widened in non-metals like quartz, spinels and sapphire, in polymers, and in semi-conductors, which at that time were academic curiosities. At that time the role of dislocations in internal damping was only beginning to be understood although it was predicted at that meeting that such damping should possess strongly directional properties and experiment has since verified this. At that time, too, little had been done with frequencies over 20 Mc/s, but now frequencies of 70,000 Mc/s have been used in damping work. These high-frequency waves can now propagate because of the modern development of crystals of very high purity and perfection, such as silicon, germanium and sapphire,

which possess so few irregularities that little scattering occurs (except from thermal phonons) even with wavelengths as small as 800 Å. Moreover, in modern high-purity metals, the mean free path of the electrons may be comparable with that of ultrasonic wave-lengths, so that interaction can occur and Fermi surfaces can be delineated. Phonon-phonon interaction, and the interaction of waves with nuclear spin and with electron spin, have only been investigated within the past dozen years. Another development of great potential importance concerns semi-conductors, such as cadmium sulphide, which also possess piezoelectric properties. In single crystals of this substance electrons can be mobilized either by an electric field or by bright light and can increase attenuation, often dramatically. When, however, the electron drift field velocity exceeds that of the ultrasonic waves, in place of attenuation, useful amplification of the ultrasonic wave can occur (see Fig. 47, p. 251, of ref. 8).

A broad outline of the subject was given in the introductory address by Dr. R. W. B. Stephens (Imperial College) and continued by Mr. G. Bradfield (National Physical Laboratory) with emphasis on experimental techniques covering a wide range of frequency, temperature and pressure—from 1/1,000 c/s to many megacycles, from absolute zero to 1,100° C and at pressures up to 1,000 bars. It was stressed that the techniques were diversified not only by these wide conditions but also because of the enormous spread of loss angle values from around unity down to 3×10^{-8} so that an embarrassing variety of equipment is involved. Prof. J. F. W. Bell (Royal Naval College, Greenwich) described a magnetostrictive method of test which would give at least qualitative information at temperatures as high as 2,300° C for both longitudinal and torsional modes.