investigations on a much larger scale using hydrogen/air mixtures. In this case the rate of recombination of the dissociated products of combustion was derived indirectly from performance calculations based upon static pressure and temperature measurements. The results indicated that although deviations from equilibrium flow occur downstream of the nozzle throat, recombination may be occurring throughout the length of the nozzle.

A further paper in the combustion series was a distinguished contribution by A. K. Oppenheim and P. A. Stern, of the University of California, in which the applicability of detonation wave studies to hypersonic combustion was investigated. The authors pointed out that the very stability of a detonation wave makes possible very precise observation and measurement, which could lead to an understanding of many of the problems in a ram jet, such as, for example, the propagation of non-equilibrium disturbances through compressible and reactive gaseous mixtures.

Detonation waves discovered by the early classical work of Berthelot Le Chatelier and others were studied from a thermodynamic point of view by D. L. Chapman and E. Jouget around the turn of the century. These workers demonstrated that detonation waves are complicated systems of shock waves followed immediately by deflagration; and later work, by means of more sophisticated instrumentation, has enabled the structure of the wavefront to be examined in much greater detail. It is clear that the team at the University of California has made great advances in this fascinating field of thermodynamics.

Not the least useful part of the paper by Oppenheim and Stern was the historical review of earlier work on detonations and explosions, together with more than two hundred references to other published work. The paper may well, therefore, become a standard reference in this field.

Following these papers on thermodynamics was the only paper on gas-turbine engines, somewhat out of context, since the speed-range considered was only up to Mach 3, and somewhat unfortunate in that it was one of the only two British papers. Nevertheless, it did reflect the emphasis in Britain of the continued importance of the lower Mach number range. Prof. J. H. Horlock, of the University of Liverpool, presented a very interesting paper on the research in turbomachinery which was still essential for the development of gas turbines capable of propelling aircraft at speeds up to Mach 3. He reviewed the current work on component efficiency, stability of compressors, blade cooling and maldistribution in the intake and compressor, all fields in which he considered there remained many problems requiring fundamental research.

Curiously, no mention was made of combustion problems which are certainly not well understood at Mach 3, nor was there any reference to the great difficulty of dealing with the noise caused by such engines, which may be a dominating factor in the choice of efflux velocity and relative mass flow.

Again, this paper contained a very useful list of nearly sixty references to the published literature.

Finally, the last session was devoted to the materials problems raised by the very high temperatures of hypersonic air-breathing engines. Papers were presented by A. J. Murphy and A. J. Kennedy, of the College of Aeronautics, Cranfield, and by P. Duwez, which were remarkable for their similarity of thought —indeed, each contained an identical diagram relating activation energies for creep, stress rupture and self-diffusion with melting temperature. Working on these lines, but also grading on a basis of low density and high elastic modulus, the advantages of tungsten, molybdenum, chromium and beryllium as refractory materials were stated. Duwez pointed out that since ram jets were constructed mainly from sheet, metals were more attractive than cermets or ceramics; but Murphy and Kennedy stressed the surface reactivity of such metals and the need for research in surface protective methods. Both papers also referred to the use of graphite, with its very high sublimation temperature and its unusual property of increasing tensile strength with temperature up to about 2,500° C.

Duwez, however, considered that materials research would not provide the entire answer to these high-temperature problems, and that porous wall cooling and ablation would be the ultimate solution for very high combustion temperatures. In the ensuing discussion, it was generally felt that the ultimate limit was likely to be an economic one.

So came to an end an extremely useful and fruitful colloquium, which provided an excellent forum for vigorous discussions in a relatively new field of applied science. As is general with AGARD meetings, the contribution of the American workers was both massive and excellent. Unusual, however, was the rather small contribution from Great Britain, the representatives of which were, in general, in the position of assimilating, rather than contributing, new information.

W. Cawood

THE PLANT PATHOLOGY LABORATORY, HARPENDEN

By W. C. MOORE, C.B.E.

THE Minister of Agriculture, Fisheries and Food, the Right Hon. John Hare, formally opened the new buildings of the Plant Pathology Laboratory at Hatching Green, Harpenden, on May 13, in the presence of more than a hundred distinguished guests and a staff of nearly sixty. The Minister recalled that the Laboratory, familiarly known for years as "Path. Lab.", was one of the oldest scientific sections of the Ministry. It was founded in 1918 at the Royal Botanic Gardens, Kew, and three years later was transferred to a converted private house in Harpenden. During the next twenty years it had consolidated its position as a scientific liaison centre and a source of advice on all aspects of plant diseases and pests. The big development of the Laboratory had come in the past two decades along with advances in the study of crop protection. The Second World War had again focused attention on maximum food production, and with the need to cut down losses from diseases and pests the Laboratory became an impor-

Fig. 1. General view of the Plant Pathology Laboratory, Harpenden, from the rear. (Photo by E. C. Large)

tant link in the complex relations which exist to-day between science, industry and the farmer. A private house was well enough with a staff of ten; but it became more and more inadequate as the work and staff increased. By 1955 the problem of accommodation had become acute. It was then that the Lawes Agricultural Trust purchased and leased to the Ministry of Works a site of nearly six acres on which a new Laboratory could be built, and during the period of construction it provided temporary accommodation for a substantial part of the overcrowded staff.

The new building lies on the periphery of the Rothamsted Experimental Station campus and its design is well adapted to the functions of the Laboratory, which are essentially still of a liaison nature. For example, the Laboratory co-ordinates a system of intelligence, survey and forecasting work on plant diseases and pests, and this involves almost daily contact with the regional plant pathologists and entomologists of the National Agricultural Advisory Service. It provides the scientific basis for the administration of regulatory work involved in the import and export of plants, in the internal spread of dangerous plant diseases and pests, and in official crop certification schemes for potatoes, fruit and hops, all of which is done in the closest collaboration with the Ministry's Plant Health Branch, the National Agricultural Advisory Service, and the Plant Health Inspectorate. It also works closely with the chemical industry in so far as it acts as a clearing house for information on the toxicity of insecticides, fungicides and herbicides to man, animal and plant, and houses an Agricultural Chemicals Approval Organization recently set up to grant official approval to biologically efficient proprietary chemicals used in crop protection, and to replace a somewhat similar scheme that had been in operation for nearly twenty years. The Laboratory also prepares and keeps under regular revision the Ministry's advisory leaflets and bulletins on common diseases and pests of plants, edits its own quarterly journal, *Plant Pathology*, and carries out research on problems arising out of administration. Collaboration in the work of inter-governmental organizations such as the European and Mediterranean Plant Protection Organization, the Western European Union and the Food and Agriculture Organization has become an important feature of its activities during the past decade.

The new building does little more than accommodate the present staff of sixty, including thirty-five plant pathologists, entomologists and chemists; but its construction and L-shaped design are such as to allow for ready expansion. The spacious entrance hall gives access to two corridors along which the laboratories and offices for plant pathology and crop protection chemistry are arranged on either side. The third department, for agricultural entomology, and the library are on the first floor above plant pathology. The chemistry wing has a flat re-inforced roof to allow for first-floor extension. About thirty of the rooms are designed to serve the double purpose of office and laboratory. In addition, there are two chemistry research laboratories, three air-conditioned rooms and a laboratory for experimental work on fumigation, separate laboratories for mycology, nematology and bacteriology (including the housing of the National Collection of Plant Pathogenic Bacteria), a combined conference and training room, photographic department, library, insect museum, general office, and workshop.

The two chemistry laboratories are identical in design, and are intended for the chemical evaluation of formulations in one, and of pesticide residues on crops in the other. To save wall space each is virtually divided into two by a central peninsula of four fume cupboards equipped with separate speed-controlled exhaust fans and external air intake fans, thus avoiding warm air being sucked out of the room. Titration benches and laboratory scaffolding with lateral service panels occupy the ends of each laboratory. Hot and cold water, electricity, gas, vacuum, compressed air, distilled water, carbon dioxide and nitrogen supplies are fed to the working benches and units from a service duct under the central corridor. Between the two laboratories are the balance and electrical equipment rooms housing a spectrophotometer and allied instruments. There is also a general purpose chemical laboratory containing large apparatus, such as a centrifuge and a deep freeze, and provided with fixed service panels and mobile benches to allow flexibility of arrangement.

Techniques for controlling pests on planting material either imported or destined for export will be studied in a new fumigation section, starting with methyl bromide fumigation of seeds and continuing with the effect of fumigants on a number of pests and plant species. A large general-purpose laboratory is intended to be used for gas analysis studies and for the biological aspects of the work. In the three air-conditioned rooms temperatures can be controlled between 5° and 30° C., and high relative humidities can be maintained, in order to be able to simulate some of the conditions which obtain during practical plant quarantine work. One room will house a 1.500-litre steel fumigation chamber for plant toxicity studies and for work on vacuum fumigation techniques, while the other two will be used for small-scale studies on the sorption of fumigants by seeds and for the rearing of insect pests.

Ancillary buildings adjoin the main laboratory. The glasshouse block includes insectaries, glasshouses of a total area of 2,000 sq. ft. divided into a number of isolated compartments, a small laboratory for plant inoculations, and a working area with potting bench, etc. Ventilators are protected by removable metal gauze panels, so that any compartment can be made aphid proof. The virus disease section has additional forced fan ventilation. The bench tops are concrete troughs so that the plants can be watered by sub-irrigation. The glasshouses are heated by small-bore hot-water pipes and auxiliary electric fan heaters, both thermostatically controlled; and there are facilities for supplementary lighting when required.

The ancillary buildings also include a room specially designed for washing soil samples to determine pest populations of soils, and a pest assessment sample room equipped to deal annually with large numbers of experimental yield samples of cereals and forage crops. A small, unique, electrically driven, highly versatile, loss-free threshing machine, designed and built at the National Institute of Agricultural Engineering, has been installed along with other equipment, including a sample dryer which can deal with wet samples before threshing as well as grain after threshing, and a modified small commercial grain cleaner.

OBITUARIES

Mr. H. W. Robinson

H. W. Robinson, who died suddenly on April 22, was a familiar and much-consulted figure in the Library of the Royal Society, with which his association was so long, so close and so valuable that the loss seems irreparable. He was born on March 23, 1888, in Wood Green, a part of London with which he was closely associated all his life, being in many ways a prominent local figure, held in affectionate regard by the residents. He joined the staff of the Royal Society in 1902, as a boy of fourteen, and soon became particularly associated with the Library, of which he was appointed assistant librarian in 1930 and librarian in 1935. When, at the age of sixty, he retired from this post, his services were retained by the Society to assist in editing the Newton correspondence, of which, happily, he was spared to see the appearance, some months ago, of the first of the seven volumes that are anticipated. With this work, to which his contributions were a model of clarity and accuracy, he was prominently associated until the day of his death.

Robinson took an enthusiastic interest in everything to do with the Royal Society's Library and with its extensive and invaluable archives. He was a self-taught scholar of considerable attainments, whose specialized acquaintance with many branches of the history of science was remarkable. He was always ready to place this exceptional knowledge, which included the whereabouts of rare books and manuscripts other than those in the Society's possession, at the disposal of students of the history of science, including many from abroad who made use of the Library, and frank acknowledgments of his generous and valuable aid are to be found in many important publications. With Prof. Harcourt Brown and Prof. D. M. McKie he founded the *Annals of Science* and he took a prominent part in founding the British Society for the History of Science.

He was particularly well acquainted with the events of the early days of the Royal Society. He had, for example, made a particular study of Robert Hooke: he identified as written by Hooke the diary in the British Museum that had always been attributed to James Petiver, and, in conjunction with Walter Adams, he edited the "Diary of Robert Hooke", in the possession of Guildhall Library, which was published in 1935. Reference has already been made to his exceptional knowledge of the correspondence of Newton and his contemporaries.

Robinson was a most friendly man, who knew his own mind and inspired confidence. He was devoted to the Royal Society, which he served for fifty-eight years, and the Society repaid his devotion with a warm regard and a respect for his specialized knowledge and achievements. He was very happy when his son Norman was appointed assistant librarian to the Royal Society, thus continuing the association which Robinson himself so long represented.

E. N. da C. Andrade

Mr. J. R. MacCabe

Jack R. MacCabe, a familiar figure to the many visitors to the European Organization for Nuclear Research, died on April 17.

Born at Edmonton, Canada, on May 4, 1914, he entered the University of Alberta in 1930. Two years later, he went to McGill University, Montreal, where, by 1937, he had taken his degrees of bachelor of science and master of science (natural sciences), while working as a demonstrator and lecturer in physiology at the University's Faculty of Medicine.

Jack MacCabe went to Europe soon after finishing at McGill and continued medical and biological studies and research at the University of Munich, up to the outbreak of the Second World War in 1939. When he arrived in Switzerland, he found a position as a lecturer at the International School and at the