British *Elytrigia*, and G. O. Allen exhibited British charophytes.

An exhibit of considerable general interest, by W. T. Stearn (Department of Botany, British Museum (Natural History)), illustrated "The creation of new species through hybridisation resulting from man's activity". This included the species which have arisen from *Tragopogon pratensis* L. and *T. porrifolius* L., and the well-known *Spartina townsendii* H. and J. Groves. From the European Herbarium of the Museum were shown type-specimens of *Limonium* and *Rubus*, and material of special interest in connexion with recent field meetings of the Botanical Society. The Library of the Museum provided unpublished illustrations of the British Flora by Miss B. O. Corfe, F. H. Round, E. F. Bedford, Miss Margaret Knox and Miss Ellen Hawkins. J. E. Raven, P. D. Sell and Dr. C. West exhibited a series of specimens of little-known British *Hieracia* set out side by side with paintings by Mr. Raven of the same specimens before they were dried. Mrs. H. N. Clokie (Department of Botany, University of Oxford) had an exhibit dealing with Jacob Bobart the elder (1599–1679) and Jacob Bobart the younger (*c.* 1640–1719).

Limitations of space prevent reference to other exhibits, and the selection has been made on the basis of those which indicate the development of our knowledge of the British flora. It is evident that much of the current research is being carried out by younger workers. Many of them wisely restrict their studies to a single species, or to a small group of species, and these are being investigated in greater detail and from more aspects than would have been possible only a few years ago. Scope for the investigation of the British flora is still great. The record of discoveries and progress of research during 1952 is highly satisfactory. J. E. LOUSLEY

[1] Lousley, J. E., *Nature*, **168**, 934 (1951).
[2] *Gardeners' Chronicle*, **132**, 112 (1952).
[3] Lid, J., "Norsk Flora", second edition, 170 (1952).
[4] Lindman, C. A. M., "Svensk Fanerogamflora", 152 (1926).
[5] Raunkiær, C. (Ed. K. Wilnstedt), "Dansk Ekskursions-Flora", 59 (1942).
[6] Allen, D. E., *Watsonia*, **2**, 282 (1952).
[7] Löve, A. and D., "Studies on the Origin of the Icelandic Flora", **1**, Dept. of Agriculture Reports, Series B, No. 2, 1 (1947).
[8] Sandwith, N. Y., *Watsonia*, **2**, 279 (1952).
[9] Groves, H., and Groves, J., *J. Bot.*, **45**, 280 (1907).
[10] Crackles, E., "The Naturalist for 1952", 183 (1952).
[11] Clapham, R., Tutin, T. G., and Warburg, E. F., "Flora of the British Isles" (1952).

NATIONAL PHYSICAL LABORATORY, TEDDINGTON

ANNUAL REPORT FOR 1951

THE annual report for 1951 of the executive committee of the National Physical Laboratory, Teddington, was presented to the meeting of the general board held on May 23 last and has since been published*. It consists of a general survey of the activities of the Laboratory and its various supervisory committees, together with more detailed individual reports, prepared by the respective superintendents or officers-in-charge, of the work undertaken by the ten Divisions, the Electronics Section and the Test House of the Laboratory.

* Department of Scientific and Industrial Research: National Physical Laboratory. Report for the Year 1951. Pp. 77. (London: H.M.S.O., 1952.) 3*s.* net.

The most important change during the year under review was the transfer of the Engineering Division to the new laboratories of the Mechanical Engineering Research Organization at East Kilbride. Other changes include the closing down of the Statistics Section of the Mathematics Division in order to concentrate on the construction and operation of the Division's two new machines, the ACE (automatic computing engine pilot model) and a 20-integrator differential analyser. No progress was made with the provision of a new ship tank and cavitation tunnel, and the Froude ship research sub-committee has expressed its deep concern at this lack of progress in the provision of what it considers to be equipment essential for the future development of the shipbuilding industry in Great Britain. An interesting development was the appointment of a small subcommittee to consider the possibilities of the utilization of solar energy.

The report states that, at the extensive series of open days, held during May 23–29, 1951, some 3,400 scientific research workers from universities, government departments and industry were invited to visit the Laboratory. On the two days prior to the meeting of the general board, a symposium on recent developments and techniques in the maintenance of standards was held[1] and the proceedings of this symposium have recently been published[2]. Other meetings held during the year included discussions on the properties of iron, on flaw detection and, with thermometer manufacturers, on the types of thermometers which the Laboratory should undertake to test.

The Laboratory took part in several exhibitions of scientific instruments, including the Royal Society soirées, the Physical Society annual exhibition, and the French scientific instrument exhibition at Paris. During the year an illustrated book, "Jubilee Book of the N.P.L.", describing the past and present work of the Laboratory, was published[3]. Other publications were the first booklet, entitled "Gauging and Measuring Screw Threads", in the series "Notes on Applied Science", and No. 1 in the short series of pamphlets dealing with the units and standards of measurement employed at the Laboratory[4]. The Laboratory has continued to receive many scientific and technical visitors from abroad, and both the director, Dr. E. C. Bullard, and senior members of the staff have paid visits to countries overseas to attend conferences or to exchange information with workers in other organizations. In addition to the names of the members of the general board, executive committee and sub-committees, the report lists the names and positions of the senior staff and includes a bibliography of the numerous scientific papers published by the staff during 1951.

The individual reports of the various sections of the Laboratory make interesting reading. The Aerodynamics Division, mainly concerned with problems connected with the design and performance of high-speed aircraft, reports much work in progress on delta and swept-back types of wings. A new high-speed laboratory was under construction, and two high-speed wind tunnels, one 36 in. by 14 in. and the other 25 in. by 20 in., together with a low-turbulence pressurized wind tunnel (8 ft. by 6¼ ft.) were being planned. In the Electricity Division two fresh determinations of the ohm, by reference to the primary standards of mutual inductance and frequency, have been made. These agreed with each other to within one part in 10^6, although they differed from the last set of absolute determinations, made

in 1936, by 15 parts in 10^6. The change is attributed to a possible variation during the past years in the inductance standard. The Light Division has been mainly occupied with the development of the new methods of producing and copying diffraction gratings suggested by Sir Thomas Merton. Flat gratings with a ruled area of 6 in. by 6 in. have been made, and a special lathe, which will enable larger gratings of particular value to astronomers to be produced, was being constructed.

In the Metallurgy Division, investigations on the influence of the interstitially dissolved elements, oxygen and carbon, on the properties of iron, the elastic and plastic deformation of metals, the creep of high-temperature metals and alloys, and the equilibrium diagrams of alloys of titanium and oxygen and of titanium, iron and oxygen, have proceeded successfully. The Ultrasonics Section of the Physics Division has been concerned with the measurement of the elastic constants of solids by dynamic methods and of the absorption of 'Perspex' and 'Catalin' over the range 1–3 Mc./s. The Radiology Section, in order to establish British absolute standards of various radioactive isotopes, has made intercomparisons of measurements and techniques of several organizations, including the Atomic Energy Research Establishment and the Royal Cancer Hospital. Agreement has been reached on some isotopes.

The bulk of the research carried out in the Radio Division has been on wave propagation, and much basic information has been obtained. The study of ionospheric conditions has continued. Semi-conductors have been given special attention, and noise in germanium diodes and triodes, together with an examination of factors affecting the performance of these valves as rectifiers, amplifiers and oscillators, have been the subjects of investigation. Finally, the report records that the volume of work submitted for test in the Test House has increased appreciably, in some instances by as much as 50 per cent, and the sum received annually from test fees has been almost doubled.

[1] See *Nature*, **168**, 594 (1951).
[2] "Rec. Devel. Tech. Main. Stand." (London: H.M.S.O., 1952.)
[3] See *Nature*, **168**, 410 (1951).
[4] See *Nature*, **169**, 267 (1952).

HUMAN RELATIONS IN INDUSTRY

THE scientific study of human relations in industry has been described by Dr. W. H. Scott, of the University of Liverpool, in two issues of the *Journal of the Institute of Personnel Management* (**34**, No. 319; March 1952; and **34**, No. 321; September 1952).

In the first article Scott examines the nature and aims of the work of the industrial sociologist. The industrial sociologist, he suggests, studies the factory as a social system, as a network of relationships between individuals and groups. The most superficial analysis reveals that these relationships are far more complex than the traditional management–worker antithesis suggests. There are the relationships which exist between persons at various levels in the 'line' organization, from the top executive to the charge-hand; between executive and 'staff' personnel; between rank-and-file employees and their immediate supervisors; between managerial personnel and employee representatives; between rank-and-file employees and employee representatives; and between the various persons at a similar level in the organization as, for example, the members of the 'top' management group, the departmental managers, the foremen, or the rank-and-file employees in a particular department.

Although the sociologist may single out one or more of these particular aspects of relationships for detailed study, all are interdependent to some extent. Thus the relationships between employees and their immediate superiors are influenced by the relationships which exist at higher levels in the 'line', and the relationships between higher managerial personnel and employee representatives are determined to a large extent by relationships within the higher management group itself. It is the recognition of this interdependence which is leading sociologists increasingly to insist that any particular problem of relationships within an organization must be studied, and resolved, in terms of the totality of which it forms only a part. Endeavours to change the behaviour of supervisors by the development of more suitable selection and training procedures, for example, will be of limited value unless such endeavours are made as part of a wider plan to change attitudes and behaviour throughout the 'line' organization as a whole. Moreover, the factory does not exist *in vacuo*, and behaviour within its walls is closely associated with the attitudes and relationships which exist in the wider community.

After considering the difficulties confronting those who wish to investigate social relationships in industry, in his second article Scott discusses some of the contributions of current systematic studies by social scientists.

The common beliefs that efficiency and, concomitantly, productivity, necessarily arise out of individual employee satisfaction or high group morale are shown to lack validity. Social scientists are concerned to discover the conditions under which high productivity and high morale are most likely to co-exist, since under such conditions the satisfaction of the needs of both the individual and the organization will be at its greatest. Evidence is increasing that fuller opportunities for self-development and a greater measure of self-determination in industry are the basic pre-requisites. This does not imply the need for more and more joint consultation; rather is it the day-to-day relationships on the job which are crucial in determining morale and attitudes. The pressing need is for the development of leadership ability and skills at all levels. Leadership at the supervisor–employee level should be integrative, seeking to elicit the maximum contribution from each member of the work team by increasing opportunities for participation and self-development, and by ensuring that the feelings and ideas of all are brought to bear on problems and decisions taken. This will not be achieved simply by developing elaborate schemes for the training of supervisors. Consultative leadership must become an accepted administrative practice at all levels.

The importance of a permissive or consultative, rather than an authoritarian, type of leadership in industry is emphasized by the differences between formal and informal social organization, which sociologists have clarified.

Formal organization defines the division of functions among persons or groups of persons and the relationships deemed necessary for their co-ordination.