one year after planting. Circumstantial evidence strongly suggests that the cuttings were invaded by the fungus while still alive. M. C. Vyvyan, C. West and H. W. B. Barlow found that a fortnight's delay in picking greatly improved the quality of Cox's Orange Pippin apples after three months in store. The delay, however, resulted in a heavy drop of fruit which could, nevertheless, be controlled by spraying with alpha-naphthalene-acetic acid (10 p.p.m.) about a month before picking. This had no effect upon the quality of the fruits. Hardwood cuttings of the plum rootstock Myrobalan B were found by E. S. J. Hatcher and R. J. Garner to root best when taken between mid-October and early February. The earlier planting, however, had more vigour of growth.

The grey mould fungus *Botrytis cinerea* probably causes more widespread parasitism than is generally realized. It is now noted by M. H. Moore as the probable cause of cankers and rotting in apple and other hosts. A. M. Massee notes some rather unusual cases of damage by insects; they include *Apion* spp. feeding on apple foliage, cockchafer larvae on the roots of hops, weevils attacking strawberry roots and earwigs feeding upon fruits of peach. Predators of the fruit tree red spider mite have been studied by Elsie Collyer. One of them, the black-kneed capsid, *Blepharidopterus angulatus*, was of practical importance in Essex. Some workers have found that nitrophenol emulsions are less toxic to insect eggs when alkaline than when acid. R. G. Davies and J. K. Eaton found this to be so, but with 2:4-dinitro-6-methylphenol (DNC) and related substances the effect would not be significant in practice between pH 4 and 8; it was only seen at pH 10.

The thirty-seventh annual report of the Station, for 1949, covers only the first nine months of the year, but is larger than usual*. The research section of the report contains twenty-four papers, including the text of the second Amos Memorial Lecture, "The Soil and the Fruit Tree", by B. S. Furneaux. Preliminary laboratory and field experiments by W. S. Rogers and Irena Modlibowska have shown that continuous sprinkling of fruit tree blossoms with water during spring frosts can protect them from frost damage at air temperatures round about -2.2°C . (28°F). Sprinkling also cooled the soil by $1-2^{\circ}\text{C}$. at 4 in. depth without harmful effect. R. J. Garner condenses, in a short paper, the results of fifteen years of work on framework-grafted Laxton's Superb on thirteen-year-old trees of Newton Wonder. This method of renovating trees gave thicker trunks, more spreading branches and heavier crops than did top grafting. N. H. Grubb describes two new raspberry varieties, Malling Jewel and Malling Exploit. The latter is stated to have superior dessert quality to the other Malling varieties. Hop stems layered prior to propagation by cuttings are shown by Dorothy J. Wilson to develop a large amount of phloem and a store of starch; buds begin to develop when light is excluded.

In the section on statistics, S. C. Pearce and J. Taylor recommend that experimental trees should be 'calibrated' by growth before an experiment is performed with them. 'Strip' and 'tile' lay-outs for this method of assessing individual potentialities are described. Studies of the organic constituents of fruit plants revealed the presence of phloridzin, glyoxal and sorbital in a methyl alcohol extract of

apple shoots (J. K. Eaton). Chromatographic examination confirmed the presence of sorbitol and phloridzin, with numerous fractions of carbohydrates, acids and other substances (A. E. Bradfield and A. E. Flood). Methods of analysis provide important contributions to research equipment; F. H. Vanstone and H. J. Philcox describe a method of building materials into a 'Cellophane' tube for flame spectrographic analysis, and A. C. Mason gives full methods for tissue analyses of small samples for seven elements; Anne V. Delap has a new interveinal injection needle.

P. C. R. Webb, studying the canker-producing bacteria, *Pseudomonas mors-prunorum* and *Ps. prunicola*, finds that bud infection of the fruiting spurs of sweet cherry is common, and frequently gives rise to cankers. Viable bacteria were isolated from surfaces which had received 6-9-100 Bordeaux spray three weeks previously. I. W. Prentice reports successful graft transmission of the disease known as rubbery wood of the apple variety Lord Lambourne. He interprets the results as supporting the view that rubbery wood is caused by a virus. A review of insect pests during the year by A. M. Massee includes special reference to the pear sawfly, a new pest of cultivated pears in Great Britain. Full details of the life-history of the strawberry aphid, *Pentatrichopus fragae-folii*, are given by G. H. L. Dicker, with the results of experiments on its control with, *inter alia*, 'Parathion' and *bis* (bis-dimethylamino)-phosphonous anhydride. The same author also describes the shallot aphid, *Myzus ascalonicus*, which has caused damage on strawberry, and the control of the apple capsid by spraying early in March with DDT dissolved in tar oil. Catherine A. Blair has investigated the life-history of the fruit tree red spider mite. Control of apple sawfly can be achieved, according to R. G. Davies and J. K. Eaton, by sprays of gamma-benzene hexachloride, 'Parathion', and the chlorinated hydrocarbon, 'Chlordane'. These substances give a superior control to that of a petal-fall spray of nicotine.

A useful series of bulletins for fruit-growers is included in the report. These deal with results which are now incorporated into modern practice, or incipiently so; it is in no invidious sense that they are not reviewed here.

SCIENCE MASTERS' ASSOCIATION JUBILEE MEETING

NEARLY a thousand members of the Science Masters' Association, which comprises the bulk of the teachers of science in the public and grammar schools of Great Britain, together with many from the universities, the modern secondary schools and from schools overseas, met in London during the first week of January for the jubilee meeting of the Association.

Morning lectures were given in the Royal College of Science, and the evening lectures in the Huxley Buildings of the Imperial College of Science and Technology, while the afternoons were devoted to visits to research laboratories, Ministry of Supply institutions and commercial works, or alternatively members had the opportunity of seeing some of the latest teaching films in science. Publishers and manufacturers showed books and apparatus useful in the laboratory, while most valuable of all was the

* East Malling Research Station. Annual Report, 1st January 1949 to 30th September 1949. Pp. 187+21 plates. (East Malling: East Malling Research Station, 1950.)

members' exhibition, in which more than fifty members showed nearly three hundred pieces of apparatus or experiments they had themselves designed or devised and had found useful in class teaching. Chief among this display was that of Mr. F. A. Meier, senior lecturer in science at the Institute of Education in the University of London, whose prolific output of ideas in new teaching devices necessitated his being given the opening session of the meeting in which to explain the wealth of ingenious apparatus he had on show for teachers of physics.

Prof. J. Z. Young, of University College, London, spoke in a crowded lecture theatre of biologists on the brain and its activities with special reference to a study of learning in the octopus. The octopus had been chosen for the study of learning because the nervous system is large, complicated and different from that of the vertebrates. The animal is convenient for experiments and operations. It is possible to show that the learning processes which go on depend upon the integrity of certain lobes. There is indication that the learning depends on the establishment of self-exciting chains of excitation. The similarities and differences between this nervous system and that of vertebrates provide most suggestive material for the discussion of the nature of the higher nervous activities. This lecture was illustrated and was built up around a film, taken by Prof. Young and his colleagues in Naples.

Thanks to the kind offices of the Atomic Energy Research Establishment at Harwell, Dr. Henry Seligman, head of the Radioisotopes Division, was able to lecture about the production and use of radioisotopes, and his assistants to demonstrate their use in agriculture, medicine and industry. The most spectacular demonstration was that of a full-scale model of a 'packaged-goods testing machine', in which cartons passing on an endless belt were detected if inadequately filled, the energy thus passing through the container being used to operate either a warning light or a mechanism for ejecting the faulty packet. Other demonstrations were given of the way in which radioisotopes can be used for detecting the uniformity of mixtures made on the commercial scale; the high degree of accuracy of measurement of the most minute particle and its location were remarkable.

The chemists of the Association were particularly fortunate at this meeting in that there were three lectures devoted to different aspects of chemistry, each amplifying the other. The president of the Association, Sir Robert Robinson, devoted his presidential address to a plea for the earlier introduction of the study of organic chemistry, illustrated by suggestions as to the way the theory should be taught and the matter presented in an up-to-date fashion.

Prof. C. K. Ingold, of University College, London, devoted his lecture to a discussion of the nitronium ion, NO_2^+ . Converging lines of approach have been followed, from the physical side, from the spectroscopical side, from the analytical side and from a study of the rates of reaction in organic nitrations, the culminating work of which is only some four months old. The properties of the nitronium ion were discussed, and crystals of some of its few stable salts were displayed. The historical development was well brought out during the lecture, each section being linked up with its fellows both in time and in purpose, while the work of the earlier experimenters

was given its due consideration, thus providing a coherent picture of the investigation as a whole and leaving the audience with such a rounded-off picture of the NO_2^+ ion that sixth-form pupils in many schools will have a clear guide through the past work and a directive by means of which future expansions of knowledge can be the more easily understood.

The third lecture of this series was given by Prof. C. A. Coulson, of King's College, London, who dealt with the nature of the chemical bond. By the use of simple wave mechanics it was shown that the pre-1926 ideas of 'discrete' electron particles moving in definite orbits has had to be discarded, to be replaced by a factor dependent upon the probability of expectation of occurrence in definite neighbourhoods. This gives rise to patterns which have replaced the old so-called valency bonds and are termed 'orbitals'. This pattern for an electron around a nucleus in an atom may be symmetrical, or it may have a semblance to a dumb-bell shape should there be two electrons, in which case they must have opposite spin. Whichever pattern is set up, however, a definite amount of energy is associated with it. For molecules, where there will be the linkage between a pair of atoms, there will be not only the atomic orbitals, but also a molecular orbital. This is not merely a summation of the atomic orbitals, but also shows a piling up of energy between the two atomic centres. From this a plan may be drawn linking together points of equal energy, giving a kind of contour map of the molecular area. Molecular linkage is then seen to be the overlapping of orbitals, so that the strongest binding takes place where there is the greatest overlapping. The angle to achieve this state gives the valency angle, and where the overlapping is reduced or diverted there is strain.

In the evenings, two lectures were given. The first was by Mr. A. H. T. Glover, and the second by Dr. W. R. Matthews, dean of St. Paul's.

Mr. Glover, director of educational research to British Pathé Films, Ltd., gave his lecture under terms of the Science and Citizenship Trust. Mr. Glover analysed the conditions of modern life and the interplay of forces impinging upon the individual and upon society, and from this devised a graphical scheme as a basis for the instruction of the 90 per cent of the school population of Great Britain which is not going to become the intelligentsia of the future. From this he indicated the part science and teachers of science have to play in the development of the citizen and in the investigation of the problems set forth.

Dr. Matthews analysed the differences between the scientific acquisition of knowledge, and religious experience resulting in knowing, and showed that, whereas scientific thought tends to predominate in concepts, religion must use images and myth as the only way to convey its ideas. So far from there being a resolution of the erstwhile conflict between science and religion, as so many affirm, there can never be, in the nature of the case, a cessation of the tension between them. Hence, each must respect the other.

On the social side, the Association was honoured by an invitation to attend a reception at the Mansion House, where the members were received by the Lord Mayor, Alderman Denys Lowson. The commemorative dinner, at which about five hundred were present, was the chief event of the jubilee. The principal guest was Mr. D. R. Hardman, Parliamentary Secretary to the Ministry of Education, who conveyed to the Association the appreciation of the

Minister for all it has done for the teaching of science. Many learned societies and kindred bodies were represented at the dinner, as were also teachers of science from abroad.

For the afternoon visits, several hitherto unopened doors admitted members of the Association to see the applications of science to many branches of human activity. Through the courtesy of the trustees of the British Museum, the Research Laboratory showed how antiquities are recovered, restored and reproduced. Scotland Yard showed conclusively that crime does not pay and has little chance of being undetected, while the demonstration of the evidence used in some recent cases were most convincing and spectacular.

Almost a thousand members thronged the Royal College of Science daily to see the exhibitions and to attend the lectures, so that a wealth of new knowledge has now gone back to the schools to bear fruit in the more highly stimulating teaching which will be given in the public, grammar and modern schools of Great Britain.

WILLIAM G. RHODES

AMERICAN PHILOSOPHICAL SOCIETY

THE year book for 1949 of the American Philosophical Society* includes, besides the reports of standing committees, list of members and auditor's report, several biographical memoirs, among which may be noted those on Dr. J. R. Angell, Dr. J. H. Jort and Dr. F. B. Jewett. The library committee reports considerable progress in acquisitions, particularly in political and scientific pamphlets of the eighteenth century, in special collections of manuscripts and in the Indian collection and archaeology. The interlibrary loan service again increased, as did the work of the microfilm laboratory. The report from the committee on publications records that, with the exception of a few libraries from which no reply was received, back publications were shipped to all libraries on the foreign exchange list. A list of publications during the year is included. The report of the committee on research sets forth the principles adopted in making grants, and lists the ninety-five grants, totalling 76,596 dollars, awarded during 1949 from the Penrose Fund. Seven grants, totalling 22,000 dollars, were made from the Johnson Fund and one of 5,000 dollars from the Daland Fund.

Among the reports from recipients of grants, that from W. J. Luyten records satisfactory progress in the measurements of the proper motions of stars in the southern hemisphere, north of declination -40° . H. H. Nininger's study of the oxidation products around Barringer crater has led him to offer a satisfactory explanation of the origin of metal-centre pellets and oxide droplets, and investigations of the structure and composition of Canyon Diablo meteorites strongly indicate that the outlying deposits have had a different origin from those which lie on or near the crater rim. V. F. Hess reports two new methods of determining the absolute intensity of cosmic rays in the atmosphere and the residual ionization in ionization chambers. Studies on snow melt are reported by J. E. Church, and the preparation and

reactions of oxygen fluoride are described by L. R. Brantley.

In the geological and biological sciences H. N. Andrews, jun., reports on studies of American coal balls in which a new species of *Botryopteris* has thrown light on the evolution of the frond. H. S. Cotton has studied a lake deposit in the Bradshaw mountains of central Arizona containing remains of Miocene or early Pliocene mammals. D. P. Costello's studies on the incidence of heteroploidy in salamander larvae and on the effects of low temperature on maturation and cleavage in fertilized eggs of *Chaetopterus* have involved four main lines of inquiry. One has indicated that *Triturus rivularis* is not well adapted to cytological studies by the methods used, and papers on two other lines of study are in preparation. J. F. Crow's study of the susceptibility to ether of *Drosophila virilis* and its near relatives, *D. americana* and *D. texana*, suggest that resistance is an expression of a general level of vigour which is high in the parents but is less in hybrid combinations because the mutually adapted chromosome sets of the parents are broken up in the recombinants.

Field studies of the genus *Sedum* in the Sierra Madre Oriental of eastern Mexico are reported by R. T. Clausen and have led to the main conclusion that the most closely related species do not occur at the same localities but in adjacent or remote regions. H. J. Dittmer reports on mycorrhizal relationships of subterranean plant parts with soil fungi, and J. Ewan on field studies on Rocky Mountain vegetation, while further ecological studies on stratification of the Arthropoda have been carried out by W. W. Dowdy. G. B. Heiser, jun., reports his studies on biosystematics of the annual sunflowers of eastern Texas and on chromosome numbers in the perennial sunflowers; and M. J. D. White is studying cytological material of various species of the grasshopper genera, *Trimerotropis*, *Circotetix* and *Aerochareutes*, collected in 1949 in west Texas, New Mexico, Arizona, Nevada, Oregon, Idaho, Montana, Wyoming and Colorado. W. Köhler reports on an investigation of direct currents which spread in the visual cortex under conditions of pattern vision, and J. L. Irvin and Elinor M. Irvin on a study of the interaction of 4-aminoquinolines and 9-aminoacridines with nucleoproteins. The antimalarial compounds quinaquine, 7-chloro-4-(1'-methyl-4'-diethylaminobutylamino)quinoline, and 6-chloro-9-(1'-methyl-8'-diethylamino-octylamino)-2-methoxyacridine interact with the nucleoprotein more strongly than with a less highly polymerized preparation of pentosenucleic acid from yeast, but the side chains of the last compound and of quinaquine do not appear to be essential for the interaction.

Among numerous researches in the field of the humanities on which reports have been received may be mentioned those of E. N. Harvey on the history of luminescence; I. B. Cohen's investigation of the work of Benjamin Franklin in relation to the development of physics and general scientific thinking and to the development of science in America; L. S. Cressman's field study of the archaeology of the Klamath Indian culture of Oregon and its position in the northern Great Basin culture; H. O'Neill Hencken's investigation of the prehistoric archaeology of the Tipasa area in Algeria; the work of H. L. Movius, jun., on Upper Palaeolithic material in France; and W. A. Ritchie's archaeological investigations in search of the earlier stages of the Curasco culture in southern Ontario.

* American Philosophical Society. Year Book 1949, January 1, 1949-December 31, 1949. Pp. 467. (Philadelphia: American Philosophical Society, 1950.)