nuclei the excitation energy is not completely redistributed during the intermediate stage of the reaction.

Experiments with Protons

An experiment on proton–proton scattering at 146 ± 1 MeV. has been made by J. M. Cassels, G. H. Stafford and T. G. Pickavance[12], using the external proton beam. At first the $^{12}C(p,pn)^{11}C$ reaction was used to measure the primary proton flux; but recently the experiment has been repeated[13] using a photographic plate method for this purpose. The angular distribution of scattering was found to be isotropic, in agreement with the results of all other high-energy proton–proton experiments; but the value of the differential cross-section (4·86 ± 0·25 millibarns-steradian^{-1}) is in sharp disagreement with a Berkeley result (3·72 ± 0·29 millibarns-steradian^{-1} at 164 MeV.).

Similar experiments have been performed at Harvard and at Rochester, at lower and higher energies respectively. The latest Rochester result is also about 30 per cent higher than that obtained at Berkeley, but the absolute accuracy of the Harvard results is not yet good enough to give definite support to either the higher or the lower value for the cross-section. The Berkeley experiments indicate that the cross-section is substantially constant from 120 MeV. to 340 MeV., and this issue does not seem to be in question. The conflict, which has not yet been resolved, is in the absolute value of the cross-section.

Attempts have been made at Berkeley with moderate success to interpret the proton–proton results theoretically. Christian and Noyes used an interaction incorporating short-range tensor forces, whereas Jastrow introduced a strong repulsive force at short distances.

A comparison of proton–deuteron and neutron–deuteron scattering at the same energy would show whether the neutron–neutron and proton–proton interactions are the same. If they are, then the only differences should be in the very forward direction, where Coulomb effects become important. Subtraction of the neutron–proton total cross-section from the neutron–deuteron total cross-section to give the neutron–neutron total cross-section has been proposed, and the Harwell results show that the result of this operation is definitely lower than the proton–proton total cross-section. The criticism can be made, however, that interference effects might be responsible; this difficulty would not arise in a comparison of corresponding proton–deuteron and neutron–deuteron effects. As a first step, experiments on the elastic scattering of 146-MeV. protons by deuterons have been carried out[14]. The results show a forward and a backward rise in the cross-section, with a broad valley of about 0·4 millibarns steradian^{-1} between 70° and 140°. They are consistent with recent measurements at Berkeley (effective proton energy 95 MeV.) and at Rochester (240 MeV.).

A proton experiment which lay outside the main programme was the investigation by J. M. Dickson and T. C. Randle[15] of the reaction $^{12}C(p,3p3n)^{7}Be$. They measured the excitation function for the production of beryllium-7, from the threshold (about 30 MeV.) to 160 MeV., using the internal proton beam. A similar experiment has been performed by T. C. Randle, J. M. Dickson and J. M. Cassels[16] on the reaction $^{9}Be(p,p2n)^{7}Be$. Both these reactions have been used to monitor proton bombardments.

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OBITUARIES

Dr. A. E. Cameron

ALFRED ERNEST CAMERON was born in 1887 in Aberdeen and was educated there at Robert Gordon's College and the University, where he graduated M.A. in 1911. He was fortunate in his teachers and supervisors—J. Arthur Thomson at Aberdeen, Sedgwick and Lefroy at the Imperial College of Science and Technology, London, and Hickson and Imms at Manchester. Under these he developed a distinct bent for entomological research, which he confirmed by visiting in 1913, with the aid of a Ministry of Agriculture scholarship, the Entomological Department of the State University of New Jersey and other entomological laboratories in America.

On his return, he occupied in quick succession lectureships in economic zoology in Manchester (1915) and Cardiff (1916), and in the following year was invited to Canada to tackle the pear-thrips outbreak in orchards in Vancouver Island. His success led to his appointment as Government entomologist in the Province of Saskatchewan (1919), and this post was combined in 1920 with the professorship of zoology in the University of the Province, at Saskatoon. On the re-organization of the Department of Zoology in the University of Edinburgh, in view of its new establishment at the King's Buildings, Cameron, partly influenced by the educational requirements of a growing family, returned to Britain in 1928 as lecturer in entomology; and in Edinburgh he completed his life's work, succeeding Dr. C. B. Williams as Steven lecturer in agricultural and forest entomology in 1932, and in 1944 being promoted to a readership.

Dr. Cameron's first important paper was a pioneer work on the relationship of the insect fauna of the soil to its environment, but most of his investigations, in Great Britain and Canada, had some economic bearing. A few of these dealt with insect pests of plants, notably his work on the pear-thrips and its

control; but the majority made valuable contributions to knowledge of the structure, life-history and bionomics of blood-sucking insects, as, for example, his many papers on the Tabanidæ and Œstridæ of Canada and Britain, and his recent collaborative work on Scottish midges.

Cameron was an M.A. and D.Sc. of Aberdeen, and M.Sc., Manchester, and in 1935 he was awarded the Makdougall-Brisbane Medal and Prize of the Royal Society of Edinburgh. Besides his teaching work in the University and Royal (Dick) Veterinary College, he acted as entomological adviser to the Edinburgh and East of Scotland College of Agriculture and consultant to the Royal Highland and Agricultural Society.

In all his teaching and research, Dr. Cameron showed great activity, alertness of mind, and meticulous regard for thoroughness. Struck down by a severe illness more than two years ago, he resigned from his readership in 1951, and died on February 27, 1952. He is survived by his wife and a family of five sons and three daughters.

James Ritchie

Mr. W. G. Campbell

William George Campbell, who died suddenly at Princes Risborough on November 24, 1951, was born at Perth, Scotland, on March 5, 1900. He was educated at Perth Academy and the University of St. Andrews, where he had a distinguished career, obtaining first-class honours in both chemistry (1923) and botany (1924). After a year's research in carbohydrate chemistry under Sir James Irvine, he was awarded a Commonwealth Fund fellowship and commenced work in 1925 at the U.S. Forest Products Laboratory at Madison, Wisconsin. Here he began those studies of wood chemistry and technology which were to constitute his life-work.

While in the United States, Campbell was awarded the M.S. degree of the University of Wisconsin, and at the conclusion of his fellowship he returned to Britain and was appointed to the Forest Products Laboratory of the Department of Scientific and Industrial Research, then occupying temporary quarters in Oxford. It fell to Campbell to draw up the initial programme of research in wood chemistry, to train staff for the work and to design the lay-out of the Chemical Laboratory in the new building at Princes Risborough. From 1930 onwards he was officer-in-charge of the Chemistry Section, with promotion to senior scientific officer in 1936, principal scientific officer in 1945 and senior principal scientific officer on personal merit in 1949. By this time he had made for himself a unique position in the field of wood chemistry and technology, and his advice was eagerly sought by scientific men and industrialists in all parts of the world. In 1944, at the special request of the American authorities, he was included as a member of the Wood Aircraft Research Mission which visited the United States and Canada. He was much in request at international conferences, and only a few weeks before his death he attended as an official British representative the twelfth Congress of the International Union of Pure and Applied Chemistry at New York, and a conference on cellulose chemistry at Appleton, Wisconsin. From the early days of the Commonwealth Fund fellowship, Campbell had acquired a growing appreciation and understanding of the American outlook, and these close ties were further strengthened by his marriage in 1928 to Frances Pendleton, of Winchester, Kentucky, who, with their son, survives him.

Campbell's success was achieved in the face of long-continued ill-health, which caused him over a period of many years much painful suffering, patiently and stoically borne. Under a quiet and modest exterior he possessed an acute mind, not prone to hasty decision but possessing in full measure insight and soundness of judgment. He was a staunch friend and a loyal and unselfish collaborator whose desire always was that the work he had at heart should prosper irrespective of personal aggrandisement. Those who had the privilege of visiting him at the Forest Products Laboratory will not readily forget the warm welcome, the quiet opening of the discussion to the accompaniment of a freshly filled pipe of tobacco, the advice offered so modestly and so unreservedly. Very quickly came the realization that here was someone whose knowledge of everything pertaining to wood was encyclopædic. Furthermore, much of this was the result of work carried out under his advice and direction. His publications comprise more than seventy papers, and cover a wide range of subjects of which only the barest outline can be given in this notice. Prominent among his interests were problems concerning the isolation and characterization of the lesser-known components of wood. These involved many fundamental investigations of analytical methods. Of special interest in this field were his isolation and characterization in 1935 of starches and other related polysaccharides from oak and walnut woods, followed later by the isolation of several wood starches in their original granular state. He made many contributions also to the study of the hemicelluloses and lignin components of woody materials.

Among Campbell's major achievements were his studies of fungal decay of wood. He showed that the brown- and white-rots of timber could be differentiated clearly by chemical methods, and he was the first to classify the white-rots on the basis of the order and mode of their attack on the major components of wood. He was the first also to demonstrate the chemical nature of the decay produced by the *Lyctus* and death-watch beetles, showing that the food of the former is inside the wood cells, whereas the latter can digest all the major components of the wood. In the course of these investigations he made important contributions to our knowledge of the nitrogen metabolism of the death-watch beetle. Much of this work had immediate practical applications, but his main contributions in this respect came during the War. Included among these were his elucidation of the influence of wood on the corrosion of metals and his fundamental work on the urea-formaldehyde resin glues used in the manufacture of laminated wood structures. Campbell became an international authority in this field, and was the first to put forward a workable explanation of the mechanism of the setting reaction for these glues, and of the mechanical behaviour of glued joints under a wide variety of service conditions.

E. L. Hirst

Mr. H. Smith

Harry Smith, or 'Smithy', as he was affectionately called by most of his colleagues, who died on February 29, occupied officially the position of laboratory steward in the Davy Faraday Laboratory of the