was only long after his time that these two ideas came into prominence in the new theory of solutions of van't Hoff and Arrhenius.

Gay-Lussac also made important contributions to chemical technology. In 1821 he showed that wood impregnated with borax is non-inflammable; in 1827 he invented the Gay-Lussac tower, which is still an essential part of the sulphuric acid chamber plant in serving to retain the oxides of nitrogen circulating through the chambers; and in 1829 he showed that an oxalate is formed by fusing sawdust with caustic alkali. He devised a burette and worked out volumetric methods for the determination of acids and alkalis, of chlorine in bleaching powder, and of silver by chloride titration, all of which are in current use.

Unlike his collaborator Thenard, Gay-Lussac did not write a formal text-book on chemistry; but his lecture notes, taken down in shorthand, were published in two volumes in 1828, those on physics being also published in the same year.

Sir Robert Christison, who attended his lectures in 1820, says that Gay-Lussac had a slender and handsome figure, a comely face and a winning expression. His voice was gentle and persuasive but firm and clear, his lectures being "a superlative specimen of continuous unassailable experimental reasoning". He married in 1808, meeting his future wife, then aged seventeen, in a linen-draper's office where he saw her reading a book. On asking what it was, she told him it was on chemistry. He had her educated in English and Italian, and during the forty years of their married life their interests were so close that it is said that even their handwriting was almost identical, it being impossible to distinguish a copy of a manuscript made by Mme. Gay-Lussac from the original of her husband.

The first half of the nineteenth century saw France pre-eminent in nearly all branches of science. Great mathematicians, physicists, chemists and physiologists taught and worked in Paris, an acknowledged centre of intellectual brilliance which attracted workers from all over the world. Among its greatest names, that of Joseph Louis Gay-Lussac has a proud place, and his laurels will ever be green.

OBITUARIES

Prof. N. Herman Nilsson-Ehle

NEWS has been received of the death, on December 29, 1949, of the eminent Swedish plant breeder and geneticist, Herman Nilsson-Ehle, at the age of seventy-seven, after a life devoted to research for the betterment of agriculture and the advancement of fundamental science. Nilsson-Ehle was not only held in the very highest esteem in his own country, but he also had a great international reputation. With his death Sweden loses one of the figures that dominated the field of crop-breeding and genetic research for many years; even in retirement he continued to stimulate work and thought in many aspects of plant improvement. Nilsson-Ehle's name will, however, always be associated with the splendid work and organisation of the Swedish Seed Association at Svalöf, the growth of which he directed during a period of the greatest importance to its history and of the utmost significance for the development of plant-breeding and genetics outside his own country.

Nilsson-Ehle received his academic training at the University of Lund, and after graduating, when he was still known as Herman Nilsson, he took part in an expedition to Siberia. On returning to Sweden he was appointed to Svalöf, as plant breeder specializing in wheat and oats under Hjalmar Nilsson—a position he held until 1915. During this time he made very important contributions to the theory and techniques of plant breeding, and was responsible for introducing breeding methods which not only became routine at Svalöf but also were accepted in other countries. As a result of the application of these techniques, several important wheat varieties were bred at Svalöf and were introduced with success into Swedish agriculture.

It is difficult to separate Nilsson-Ehle's contributions to practical breeding from his researches in genetics. His study of the inheritance of important economic characters such as yield, hardiness, earliness, disease resistance and grain colour were instrumental in developing the theories of quantitative character inheritance and the action of polymeric factors which are of such significance to the breeder. With the acceptance of the concept of transgressive segregation, and the more intelligible interpretation of the effect of environment on complex multiple-factor inheritance, breeding was put on surer ground, and hybridization as a means of crop improvement received considerable stimulation. During this period Nilsson-Ehle conducted intensive studies on large-scale hybridizations of wheat and oats, and with the development of genetical concepts came new ideas on breeding techniques.

In 1910 he proposed and introduced a new and simpler method of handling hybrid progenies, by which pedigree selection and yield tests were carried on side by side during segregating generations. This method is still used at Svalöf, as also is the bulk or population method devised by Nilsson-Ehle and introduced a few years earlier. By this latter method, selection is deferred to the later generations when a high degree of homozygosity has been reached, and although not generally approved or used, it has certain advantages, particularly in the exploitation of natural selection when such is desired. It is true to say that no revolutionary changes have been made in the technique of handling hybrid populations in self-pollinating crops since these innovations, and most breeders use these techniques or modifications of them.

In 1915 Nilsson-Ehle was appointed to the chair of botany at the University of Lund, and two years later this was changed to a personal professorship of genetics with an institute at Åkarp. During this period he continued his investigations on the genetics of cereals until in 1925 he was recalled to Svalöf to succeed Hjalmar Nilsson as director. Nilsson-Ehle directed the activities of Svalöf for fourteen years, during a time of considerable expansion of the scientific and practical breeding activities of that important centre of research which has become a model of its kind. Not only has Svalöf contributed improved varieties of crop plants—particularly oats and wheat—which have played an important part in raising the productivity of Swedish agriculture, but also some of these varieties have been introduced with profit to other countries, including Britain.

Among other developments at Svalöf due to Nilsson-Ehle's inspiration was the founding of a cytogenetic department in 1931 "for research on chromosomes and the breeding methods based thereon". The realization of the significance of polyploidy in the phylogeny and evolution of culti-

vated plants, and the association of certain important biological characters with polyploidy, led to speculation about the possible application of artificially inducing polyploids—both autopolyploids and allopolyploids—to plant breeding. The cytogenetic department at Svalöf developed these ideas, and with the discovery of the colchicine technique considerable impetus was given to both the fundamental scientific aspects and the breeding approach. In addition, work was developed on the artificial induction of mutations, a problem which had attracted Nilsson-Ehle since his studies of naturally occurring mutant forms in wheat, barley and rye, and on which he had published many papers.

After his retirement, Nilsson-Ehle continued to be actively interested in plant-breeding. It was due to his energetic interest that institutes for the improvement of forest trees and fruit trees were founded, while he himself devoted time to the breeding of the giant aspen. His great energies and capacity for work have left their mark on scientific research, on agriculture through crop improvement, and on the institutes which he guided. In the academic sphere his long association with the lecture room and laboratory inspired and stimulated a great number of students and research workers who came under his influence, and it is gratifying to know that his name was honoured by the creation of a fund in 1943, the revenue from which will be used for stimulating genetics research. G. D. H. Bell

Prof. G. H. Livens

With the unexpected death of Prof. G. H. Livens on March 26, the University College of South Wales and Monmouthshire, Cardiff, has lost not only a distinguished mathematician, but also one who has rendered valuable service to the College for the long period of twenty-seven years.

Born in 1886, he received his early education at the Latymer Upper School, Hammersmith, before proceeding to Jesus College, Cambridge. At Cambridge he had a distinguished career, being bracketed fourth wrangler in Part I of the Mathematical Tripos of 1909, the last year in which the lists were published in order of merit, and being placed in Class I, Division 2, in Part II in 1910. In 1911 he was awarded the first Smith's Prize, and in the same year he was elected a Fellow of Jesus College.

Meanwhile he had been appointed lecturer in geometry at the University of Sheffield, where he stayed until 1919, when he became senior mathematical lecturer at the University of Manchester. He was elected to the chair of mathematics at Cardiff in 1922.

It was during his period in Sheffield that Prof. Livens started to publish numerous papers on electrical theory, and his "Theory of Electricity" was first published in 1918. Later he published papers in many branches of applied mathematics, but chiefly in electrical theory, magnetism and thermodynamics.

In educational affairs generally, Prof. Livens took a very active part. Besides his departmental duties, he gave loyal service in the faculties and the Senate, and in the many committees on which he served he was always much esteemed, not only for his personal integrity and sincerity, but also for the valuable contributions he made to the business under discussion. His decisions were made without prejudice, and with no thought of personal interest.

Prof. Livens's interests extended beyond the University, however, in many directions—to the mathematical courses in the Welsh training colleges, to the Central Welsh Board as an examiner and adviser for many years, to the local branch of the Mathematical Association—and it may well be said that he did great service in guiding the development of the study of mathematics in Wales. His value as an examiner is also shown by the fact that he was an external examiner for the University of London from 1929 until his death.

Prof. Livens will be remembered with affection by many generations of students who always found him willing to be helpful; his staff will remember with gratitude his continual readiness to discuss all aspects of their departmental and research work, and also the value of his advice and guidance.

R. M. Morris

Dr. F. W. Foxworthy

Dr. Fred William Foxworthy, forest research officer during 1918–32 in the Federated Malay States, died suddenly in Berkeley, California, on February 4. He was the younger son of a Methodist minister, and was born on July 7, 1877, at Goodland in the State of Indiana. His education to 1899, when he graduated in science at the De Pauw University, was within his native State; then he proceeded to Cornell, where he was given a teaching post and took the degree of Ph.D. in botany (1902). Many knew him in those college days as a boxer, a football player and a redoubtable baseball player. In 1906 he was appointed a botanist in the Bureau of Science, Manila, and gradually became a forester: a dominating interest in the ecology of the forests led to it.

The trees having determined his bent, he was made wood technologist in the Bureau and associate professor of dendrology in the University of Manila. It was natural that he should turn from the Philippine forests to compare them with those of other parts of Malaysia; and, with the conservator of forests, British North Borneo, he published in 1917 an account of the mangrove and nipa swamps of northern Borneo through which runs a comparison of these formations in the two places. In 1918 he accepted the appointment of forest research officer under the Government of the Federated Malay States. This new post brought to him unrivalled opportunities for work; and he used them to great advantage: splendid undamaged forests were coming under control, and the large active staff controlling them was ripe to aid in collecting specimens and making observations; his part was to sift, to direct and to attach the technology to the botany. Building up a small museum of forest products and a forest herbarium, he had by 1927 materials for his "Commercial Timbers of the Malay Peninsula" (*Mal. For. Rec.*, No. 5) and, on a narrower front, by 1932, materials for his "Dipterocarpaceæ of the Malay Peninsula" (*Mal. For. Rec.*, No. 10): at various dates there were less exacting publications. The second of the two named greatly advanced our precise knowledge of the chief sources of Malayan timber.

Retired at his age limit, Dr. Foxworthy went back to the United States and, marrying, settled at Berkeley, California, living actively, teaching, writing, joining in the scientific life of the neighbourhood of San Francisco, and during the Second World War called to war work. In 1936 he was president of the California Botanical Society. Later he wrote for the