scientific account of the cultivation and utilization of jute and some other fibrous plants growing in India, and is notable for the precise descriptions and presentation of results of experiments conducted by him at the Honourable East India Company's (now Indian) Botanical Garden at Calcutta.

The descriptions of the two species of jute, namely *Corchorus capsularis* Linn. and *C. olitorius* Linn., which yield fibres of commerce, are recorded by him in yet another posthumous publication in three volumes entitled *Flora Indica* (1820–32), which again is the basis of all subsequent Indian botanical works on taxonomy and floristics. This pioneering effort rightly earned for him the title of "the Father of Indian Botany", and until 1872, when the publication of Hooker's *Flora of British India* started appearing in a series, Roxburgh's was the only available single work through which a knowledge of Indian plants could be acquired. In the field of economic botany also, it was the only source of information until the publication of Sir George Watt's *A Dictionary of the Economic Products of India*, the first volume of which appeared in 1889. Roxburgh's other botanical works, particularly *Plants of the Coast of Coramandel* (in 3 volumes) and *Hortus Bengalensis*, and albums containing original paintings of Indian plants, are also well known as accomplishments of a very high order.

Roxburgh first accepted an appointment on the Honourable East India Company's Madras Establishment in 1776, and there he became acquainted with Dr. John Koenig, a pupil of Linnaeus, which no doubt influenced his subsequent work in India. He took charge of the present Indian Botanic Garden in 1793 as its first official superintendent, and with his great foresight he included both purely scientific and commercial aspects of botany in his programme. He established the great herbarium of the Botanic Garden for floristic and systematic studies of Indian plants, and at the same time started the introduction, cultivation and utilization of economic plants in India. (Most of Roxburgh's collections were distributed to the European herbaria by his successor, Dr. Nathaniel Wallich. The present herbarium was in fact made by Sir George King (superintendent, 1871–97) from the nucleus of collections started by Dr. William Griffith (Offg. superintendent, 1842–44) and developed by his successors in office. It is now the 'Central National Herbarium' of India.) Among the many plants he introduced at Samulcotta and at Calcutta, the most important are reported to be cinnamon, coffee, mahogany, mulberry,

nutmeg and pepper. It is also reported that he took an active interest in the improvement of sugar cultivation, in the rearing of silkworms and in the manufacture of silk. He left India in 1813.

Long before Roxburgh started his experiments on fibrous plants at the Indian Botanic Garden, both the species yielding jute used to be variously cultivated by local people. Roxburgh readily realized the great commercial value of jute fibres, and took up experimental cultivation of jute in the Garden, retted his produce, and measured the strength of their fibres in twisted condition before and after tanning or tarring them. Very soon he exported the first hundred tons of raw jute to Britain, and thus paved the way for the development of the jute industry in India. His untiring efforts with jute and a number of other fibres, the samples of which were sent to India House and to the Society (now the Royal Society) of Arts in London, were acknowledged by the award of the Society of Arts' Gold Medal to him on no fewer than three occasions. Many of these fibres are described in the Society's *Transactions* for 1804.

The subsequent history of the modern jute industry is another story, which, however, no doubt owes its origin to the genius of Roxburgh. Its development is a fascinating narrative told in a series of articles by Mr. D. R. Wallace in the *Empire Evening News* of Calcutta and later published as a book—*The Romance of Jute* (Calcutta: 1909), which itself has now become almost a historical document.

Near the 'Great Banyan Tree' of the Indian Botanic Garden, there is a simple monument (on the top of a small mound) to the memory of Roxburgh. The Latin inscription on the monument is by Bishop Heber, and the English rendering of the inscription (as follows) by Reverend Father Santapau written on a separate tablet was fixed last year to the slope of the mound (bearing the monument) for ready appreciation by the people of India whose debt to Roxburgh still remains immeasurable.

Whoever You Be
If this place soothes the mind with its sweetness
Or teaches you to think of God with reverence
You must hold in high honour
R O X B U R G H
Formerly the Superintendent of these Gardens
A man distinguished for his Botanical Science
And most able planner
Of rustic pleasure
His country preserves his remains
Here lives his genius
May you enjoy thoroughly
To his cherished memory his Surviving Friends
A.D. 1822

OBITUARIES

Dr. A. R. Zhebrak

ANTON ROMANOVICH ZHEBRAK, a well-known geneticist of the U.S.S.R., died suddenly on May 20 at the age of sixty-three. He was also a statesman and one of the organizers of the U.N.O. as a member of the U.S.S.R. delegation to the San Francisco International Conference. As a highly educated biologist and a frank man he was a zealous champion against Lysenko. Zhebrak was therefore in disgrace for many years and died debarred from teaching genetics in the Timiriazev Academy of Agriculture in Moscow, from which he had been banished in 1948.

Zhebrak was the son of a poor peasant. As an able boy he rose fast during the revolution, became a student of the Academy of Agriculture in Moscow, and later professor of genetics in his *Alma Mater*. The scientific works of A. R. Zhebrak with crosses of wheats and their allopolyploids brought him fame and a scientific and political career. He was president of the Academy of Sciences of Byelorussia.

As a stalwart biologist Zhebrak could not reconcile himself to the absurd conceptions of Trofim Lysenko and was his energetic opponent. He was also a patriot and mourned the shame of his native land. In one of his articles in the American press he tried to demonstrate that Lysenko had given some services to agriculture, and that these services, and not his lack of knowledge of genetics, were the reason for the decorations of this careerist. But unfortunately Zhebrak was mistaken. Just the ignorance of Lysenko and his sycophancy won for him the love of Stalin and Krushchev, who were men not sufficiently educated in biology and agriculture.

When in 1948 Lysenko and his friends resolved to destroy any opposition to their dogmas, A. R. Zhebrak was one of the first to be removed from work in genetics. He was deprived of his Department of Genetics in the Timiriazev Academy of Agriculture and his post of president of the Academy of Sciences of Byelorussia, condemned by a Court of Honour for his speeches and articles against Lysenko, was out of work and only later admitted as

professor of botany in the Moscow Pharmaceutical Institute. He died in this post.

Being in disgrace and having no great opportunity for his genetic works, Zhebrak continued them as a private citizen. Some of them have been published since the death of Stalin. The great merit of Zhebrak was that he, as a professor of botany in the Pharmaceutical Institute, continued to prepare new Russian geneticists as his disciples in botany. Dr. Zhebrak was a very kind, compliant, tolerant and honest man, but was irreconcilable to a falsification of science and intolerant of scientific careerists. Many young geneticists, his disciples, met near his coffin to see their beloved teacher on his last journey. Almost all the Russian geneticists were present at the funeral of their friend and companion in arms in the struggle for the scientific truth.

Anton Zhebrak lived until the time when the Russian people and its Government understood the scientific ignorance of Lysenko and the damage of his delirious conceptions for the development of science and agriculture. But the correction of old mistakes continues meanwhile very slowly. In 1948 Lysenko, as a favourite of Stalin, seized the Department of Genetics in the Moscow Academy of Agriculture and for more than sixteen years carried out his absurd genetics for young students. In March 1965 he abandoned this post, mocked and held in contempt by his students, but Zhebrak was still not returned to his old legitimate post—which is now vacant. Nevertheless, we trust that the U.S.S.R. as the country of N. I. Vavilov and A. R. Zhebrak will return to its place of honour in the field of development of scientific genetics and plant breeding.

A. KUPZOW

Dr. A. C. Graves

DR. GRAVES, Test Division leader at Los Alamos Scientific Laboratory, died suddenly on July 29 while on holiday near Del Norte, Colorado. He was fifty-five years of age.

Dr. Graves, who most recently flew as a scientific crew member during the May 1965 Solar Eclipse Expedition in the South Pacific, had been a member of the Army Scientific Advisory Panel, and scientific adviser at the Nevada Test Site and Pacific Proving Ground since 1955. He was deputy scientific director during 1947–48, and scientific director during 1948–55 of Pacific Proving Ground operations; and test director at the Nevada Test Site during 1951–54.

Dr. Graves was one of the pioneers in the practical applications of nuclear energy. With forty-one other scientists, he helped build the world's first chain-reacting pile—the reactor in the squash court of Stagg Field in Chicago which proved, on December 2, 1942, that a chain reaction could be sustained and controlled. Ever since then Dr. Graves has been intimately associated with atomic energy work.

Dr. Norris E. Bradbury, director of Los Alamos Scientific Laboratory, said: "The tragic death of Alvin Graves leaves me, as I know it does the rest of the Laboratory and the community, with the deepest sense of shock and personal loss. No one has contributed more to the success of the Laboratory from the beginning of the project and at the same time played so active a part in the service of the community. He was one of the pioneers in the field of nuclear energy, having been involved in every major development in this field from the first atomic pile in Chicago in 1942, the first atomic bomb test at Trinity in 1945, and with nearly every atomic test conducted by this country since then. Los Alamos will not be the same again without his dedicated and devoted service."

Dr. Graves was a physics instructor during 1939–41, assistant professor in 1941, and associate professor (on leave) during 1942–60 in the University of Texas. From

1942 until 1943 he was with the University of Chicago Metallurgical Laboratory. He joined the staff of Los Alamos Scientific Laboratory in 1943 and became head of the Laboratory's Test Division in 1948.

E. W. Golding, O.B.E.

MR. EDWARD WILLIAM GOLDING was born on March 9, 1902, at Northwich, Cheshire, and died at Ewell, Surrey, on June 2, 1965. He was educated at the Sir John Deane's Grammar School and at Manchester College of Technology, where he studied, as student and research scholar, under Prof. Miles Walker. He obtained his degree of B.Sc.Tech. in 1923 and that of M.Sc.Tech. in 1934. On leaving the College, he served for two years in the Research Department of Metropolitan-Vickers Electrical Co., Ltd., at Manchester, and in 1926 was appointed lecturer in electrical engineering at the then University College of Nottingham.

Specializing, at first, in electrical measurements, he later became interested in the applications of electricity to agriculture and horticulture. His investigations of these subjects were undertaken with the meticulous thoroughness which characterized all his work, and his first book, *Electrical Measurements and Measuring Instruments* (1933), now in its sixth edition, was followed by *The Electrification of Agriculture and Rural Districts* published in 1936.

He was, in those days, an enthusiastic and competent golfer, and memories of his burly figure striding purposefully around the Wollaton Park course will always remain with those who knew him there. In 1944 he was transferred from associate member to member of the Institution of Electrical Engineers, and, in 1945, he joined the Electrical Research Association as head of the Rural Electrification Section. To this post was added, in 1948, responsibility for the work of the newly established Wind-power Section. The investigation of the possibilities of large-scale generation of electricity by wind-power soon developed into a major interest which brought him into contact with people from all over the world. He became a member of the Working Group (Windpower) of O.E.E.C., acted as Unesco adviser, on problems of energy, to the Arid Zone Research Advisory Committee, and carried out missions for the United Nations and its specialized agencies in Israel, India, Somaliland, Haiti, Uruguay and Egypt.

Although Golding's writings were part of his work, they were also his main hobby and always gave him great pleasure. In 1955, *The Generation of Electricity by Wind Power* was published. This was followed by two major Food and Agriculture Organization Bulletins: *Windmills for Water Lifting and the Generation of Electricity on the Farm* and *The Potentialities for Rural Electrification in Asia and the Far East*, and a booklet, *Power Supplies*, written for the Overseas Development Institute. Throughout the years he maintained a close association with mining engineering matters and was a past-president (Midland Branch) and Fellow of the Association of Mining Electrical and Mechanical Engineers as well as being examiner for Associate Membership of the Institution of Mining Engineers. He was also a member of the Institution of Agricultural Engineers and a Fellow of both the Royal Horticultural Society and the Royal Geographical Society. In 1956 he was awarded the O.B.E. for his services to developing countries, and in 1958 the duties of overseas liaison officer were added to his other Electrical Research Association responsibilities. He continued to travel widely, acting as adviser on power supplies in remote areas to Government departments in many countries, lecturing to engineering and scientific societies, schools and clubs and visiting many members of the Electrical Research Association overseas. He was, also, a most