shoot and leaves, and (2) to various elaborations of these patterns by differential or allometric growth in the sub-apical and maturing regions.

Factors of various kinds, genetical, nutritional, correlative and environmental, may, in different instances, affect the primary pattern and the nature of differential growth. Accordingly, the view was advanced that the phenomena of organization in plants lend themselves to analytical and experimental investigation, but synthesis is evidently an essential part of the task.

Dr. T. A. Steeves (University of Saskatchewan) then contributed a detailed analysis of the growth and morphogenesis of the leaf of *Osmunda cinnamomea*, dealing first with the inception and development of the circinate-coiled primordium and of the maturing but still rolled leaf, and then with the further physiological activities which result in the uncoiling of the more or less adult leaf in spring. Particular attention was given to the relative roles of cell division and cell elongation in the ground tissue of the leaf rachis throughout development. The coiled condition of the rachis in the crozier was interpreted as the result of more cell division abaxially than adaxially during its formation, and uncoiling depends on the equalizing of cell numbers by cell division late in leaf development. Cell elongation in *O. cinnamomea*, except in the leaf base, is delayed until the fifth growing season, at which time it extends acropetally along the rachis. Leaf elongation in several ferns depends on diffusible auxin, probably indolylacetic acid, from the pinnae. Leaf primordia, after being determined, can complete their development in isolation in sterile nutrient culture, indicating that the essential features of leaf formation are regulated within the organ itself. The small size of cultured leaves is the result of diminished cell division in the rachis and appears to have a nutritional basis.

Finally, in this session, Dr. A. Allsopp (University of Manchester) summarized and illustrated his many experimental investigations of morphogenesis in *Marsilea* spp., using aseptic culture technique. Special attention was given to the effects of nutri-

tional factors and growth-regulating substances in heteroblastic development and other organizational features, and to the physiological conditions which determine the characteristic features of land and water forms. He concluded that the changes in leaf segmentation of *Marsilea*, or heteroblastic development, are correlated with changes in the size of the apical meristematic regions of the shoot, which in turn are influenced by the nutritional status of the plant. On the other hand, the differences between land and water forms are probably due to differences in the available concentration of dissolved carbohydrates in the growing parts.

When I reflect on the symposium as a whole, my thoughts naturally turn to Hofmeister, Goebel, Campbell, Bower and Lang, and to the many other distinguished botanists of past times who contributed so much to our knowledge of the growth and morphology of archegoniate plants, and, not least, who were so profoundly interested in the causes underlying their singularly unlike alternating generations. Had the shades of those eminent ones lingered awhile on this occasion, they might well have been stirred to surprise and wonder at the interest these plants and their problems still command; and, like myself, at the end of the meeting, they might perhaps have entertained the optimistic view that, although we evidently still have a very long way to go, we are at length coming within tangible distance of a more factual interpretation of some aspects of the growth, morphology and life-cycle of these enigmatic and fascinating plants. Accordingly, this is a suitable place to express the appreciation of all who participated in these sessions to the president and officers of the Linnean Society for arranging the symposium, and to the British Council and the International Union of Biological Sciences for very substantial financial assistance, without which, indeed, the symposium could not have been held.

The papers contributed will be published collectively as a number of the *Journal of the Linnean Society* as soon as possible and this may be obtained from the Society.

C. W. WARDLAW

OBITUARIES

Dr. L. G. G. Warne

THE University of Manchester has lost a valued member of staff in the sudden death of Leslie Gordon Glynn Warne on May 3, aged fifty-three years. He had suffered a severe coronary thrombosis in 1955, which slowed his movements somewhat; he was well aware of a possible fatal recurrence, but he retained full mental vigour, wonderful personal equanimity, and continued his university activities as senior lecturer in horticulture and assistant director of the Experimental Grounds. Actually, he was engaged on field work at the experimental grounds of the University, Jodrell Bank, Cheshire, when he collapsed.

Warne was born at Faringdon, Berks., on June 25, 1908. On leaving St. George's Secondary School, Bristol, he was employed for three years in investigational work in the laboratory of Messrs. H. J. Packer and Co., Ltd., cocoa and chocolate manufacturers. In 1928 he entered the University of Bristol, and in 1932 he graduated with first-class honours in

botany. In 1933 he was awarded M.Sc. and in 1936 Ph.D. He joined the staff of the University of Manchester in 1934 as assistant lecturer in botany, served the Department in many ways and was appointed senior lecturer in horticulture in 1948. This is an endowed post, the aim of which is to help gardeners and others to secure adequate scientific and professional training and to encourage horticulture in the region. Warne had a considerable share in organizing the Experimental Grounds and evening classes in botany and horticulture in this connexion. Indeed, his gifts as an organizer and as a practical gardener not only equipped him for this work and brought him success, but were also a great asset to the Department.

In 1953 the University granted him three years leave of absence to occupy the chair of botany at Karachi, Pakistan. There his varied ability again bore fruit, and his keenness and energy enabled him to acquaint himself with the work of other institutes in Pakistan and India, and to become familiar with tropical vegetation and agriculture.

During his earlier period in Manchester, Warne had complete responsibility for the degree course in plant physiology for about twelve sessions. He also taught medical (1st M.B.) and dental students for several sessions, and served on various university committees. His outside activities involved him in active membership of learned societies and of examining bodies. He had a large number of published papers to his credit and was jointly responsible for the revision of Lowson's *Text-book of Botany* for use in Britain and also for India, Pakistan and Ceylon. He was also joint author of a *Practical Botany* for home use, and one for use in tropical countries.

In 1941 Warne married Miss M. M. Walker, whom he had met some years before at Long Ashton, and who was a lecturer at Swanley Horticultural College, Kent. He is survived by his wife and three daughters. Both in the Botany Department and more generally in the University he will be greatly missed as an unusually genial, even-tempered and helpful colleague.

W. O. HOWARTH
C. W. WARDLAW

Dr. T. U. Matthew

DR. T. U. Matthew, director of manufacturing of Massey-Ferguson (United Kingdom), Ltd., and the first Lucas professor of engineering production in the University of Birmingham, died in Scotland, following a brief illness, on May 11, at the age of fifty-two.

Thomas Urquhart Matthew was educated at George Heriot's School, Edinburgh, the Royal Technical College, Glasgow, and King's College, Cambridge. He had production engineering and consultative experience in Great Britain and in South Africa, where he was technical adviser to the Government, before his appointment to the newly endowed Lucas chair in 1948. It was said, at the memorial service held on May 23, that the pioneer Department of Engineering Production which he developed at Birmingham would be his lasting memorial. In 1955 Dr. Matthew returned to industry as production director of Tube Investments, Ltd., and joined Massey-Ferguson a little more than a year ago.

As Lucas professor, Dr. Matthew was charged with determining and elucidating the principles of efficient production engineering, and the emergence of production engineering as a university discipline is, in large measure, a tribute to his ability. He pioneered the application of scientific method to complex problems of production planning, organizing and control, and was one of the first to recognize the contribution that operational research could make in this field. He was a modest, courteous and generous man, who devoted the whole of his time and energy, and considerable analytical gifts, to the service of industry and education for industry. He served the Institution of Production Engineers in many capacities, and was a member of its Council, chairman of the Birmingham Section, and chairman of the Education Committee at the time of his death.

In 1952, he led an I.L.O. Technical Assistance Productivity Mission to the engineering and textile industries of India. He was a founder-member of the International University Contact for Management Education, which brought him into close and continuing contact with his colleagues in Europe and America. About the same time, he established, at Birmingham, the University Institute for Engineering Production to serve as a link between his postgraduate

Department of Engineering Production and practising production engineers. After his own return to industry, his keen interest and efforts on behalf of the Department remained undiminished.

Dr. Matthew leaves a widow and three sons.

N. A. DUDLEY

Dr. H. McCombie

DR. HAMILTON MCCOMBIE, reader emeritus in chemistry in the University of Cambridge, died at Woking on May 31, aged eighty-two. McCombie will be remembered for his distinguished service in the First World War, for his work in connexion with chemical defence, and by his many pupils in Birmingham and in Cambridge. A Scot of the Scots, he was born in London, but in 1900 atoned by taking an ordinary M.A. of the University of Aberdeen. A London B.Sc. with honours in chemistry followed, and he went on in the old tradition to Strasbourg to work under Thiele, getting his doctorate there in 1905.

His first appointment was as lecturer in chemistry in the University of Birmingham, where he became interested in reactions in non-aqueous solvents, work which he continued later in Cambridge. He was in Australia in 1914 to attend the meeting of the British Association. There was the rush back home. His enlistment in the Worcesters followed, but he was soon transferred to the Special Company, Royal Engineers, on its formation after the first German gas attack. There his knowledge and steadfastness proved invaluable and were recognized by the awards of the M.C. and the D.S.O., the Croix de Guerre and two mentions in despatches.

He was elected a Fellow of King's College, Cambridge, in 1919 and served his College and University until his retirement in 1945. In King's he became assistant tutor for natural sciences when C. T. Heycock retired, and he held this office until 1945, in the earlier years jointly with Sir Joseph Barcroft. Kingsmen remember him with affection, and acknowledge the debt they owe to him. He was wise in counsel, and long service on the College Council, on its Estates Committee and as an elector to fellowships was demanded from him and given ungrudgingly except, perhaps, when there was an important rugby match at Grange Road. In the University he lectured on inorganic chemistry to the large class of second-year men about to take Part I of the Natural Science Tripos, and he ran a laboratory to which usually only scholars and exhibitors were admitted. Once in, a man could attend when he liked and do very much what he liked.

Between the Wars, McCombie directed a very substantial volume of fruitful research, first on antidotes to mustard gas and, later, on the phosphorus gases. During the Second World War he was a deputy chairman of the Joint Recruiting Board and acting head of the Chemical Laboratory after the death of Sir William Pope. After his retirement he lived quietly at Woking to be near one of his daughters and his grandchildren.

Prof. P. Hoffmann

PROF. PAUL HOFFMANN, for many years professor of physiology in the University of Freiburg, died on March 9 in his seventy-eighth year. He was a scientist of distinction and a man of great personal charm, modest, tolerant and wise. His most important work dates from 1910, when he began the study