

it seems that the forces responsible for amoeboid movement must originate at some site other than the surface membrane. However, the membrane may play an extremely important part as regards the control of movement. This has already been pointed out in relation to the bioelectric potentials across the membrane, which may control the direction of movement¹⁸. It is possible that the flow properties of the membrane may also be a feature of some importance in locomotion, pinocytosis and phagocytosis. For example, pinocytosis may be associated with reduced membrane flow, and new pseudopod formation may result from an increased fluidity of the membrane.

We thank Prof. J. F. Danielli for his encouragement and advice; Dr. E. H. Mercer, of the Chester Beatty Research Institute, for the electron microscopy; Dr. C. Hoskins (National Institutes of Health postdoctoral Fellow) for assistance with micrurgy; Dr. E. A. Barnard and C. M. Thompson for helpful discussions; and Mrs. J. L. Stewart for culturing the amoebae. The work was supported by the Nuffield Foundation.

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OBITUARIES

Sir John Edgell, K.B.E., C.B., F.R.S.

VICE-ADMIRAL SIR JOHN AUGUSTINE EDGELL died in Salisbury on November 14. He was the younger son of the late James Edgell of Teddington, and was born on December 20, 1880. He joined H.M.S. *Britannia* at the age of thirteen and, nine years later, specialized in hydrographic surveying. His first ship, as sub-lieutenant, was H.M.S. *Triton* surveying in the North Sea.

In 1912 he was given his first command, H.M.S. *Mutine*, and served for the next two years on the west and south coasts of Africa. Later, he commanded H.M. Ships *Triton*, *Hearty*, *Endeavour*, *Merlin* and H.M.A.S. *Moresby*. His surveying duties took him to most parts of the world, and he was in charge of surveys in China, Australia, the Red Sea, Mediterranean and the south and west coasts of Africa. He was promoted to commander in December 1915 and two years later became superintendent of charts, which post he held for two years. After a period at sea, he returned to the Admiralty as superintendent of charts during 1923-25. He was promoted to captain in 1923.

Edgell held the appointment of assistant hydrographer during 1928-30 and again during 1931-32; the intervening period he spent in command of H.M.S. *Endeavour* in the Red Sea. He became hydrographer of the Navy in October 1932 and held this post for the next thirteen years, a term only exceeded by Admirals Beaufort and Wharton. He carried the burden of this appointment throughout the Second World War. His service as superintendent of charts during the First World War stood him in good stead, and the experience he gained of the chart production unit in H.M.S. *Endeavour*, during the Dardanelles Campaign, led to similar equipment being installed in H.M.S. *White Bear* for service in the Burma campaign during 1943-45.

Shortly before the outbreak of war in 1939, plans had been made to transfer the Admiralty Chart Establishment at Cricklewood to a specially designed building, equipped with up-to-date rotary offset

printing machines, at Taunton. The move did not take place until 1940, and the Cricklewood establishment suffered damage from the early air raids; but output was not affected. In accordance with general policy, the Chart Branch, situated in Cornwall House, London, S.E.1, was transferred to Bath shortly after war broke out and, at the same time, expanded enormously to cope with the extra demand for special charts. When the Production Division was set up at Taunton, the Issues Division also moved to Taunton from London, and, being under the same roof, was able to cope with the enormous increase in demand for charts, now turned out at a far greater speed on the new presses.

Edgell was most energetic throughout the War in meeting all the calls made on the Hydrographic Department and enjoyed great foresight in planning and preparing new types of charts for the ever-growing tempo of the War. Among his most successful innovations were the chart maps prepared originally for the landings in Sicily and which later were invaluable for the Normandy landings.

His surveying ships and detached officers were engaged in all theatres, from Norway to Burma, and carried out their work inspired by his leadership at the Admiralty.

His horizon was wide and he kept himself fully up to date with modern developments, though his service had begun in the days of sail and sounding under oars. He pressed forward with the introduction of echo-sounding equipment so that, in 1939, the new surveying ships he had done so much hard work to obtain were fitted with the latest types capable of obtaining soundings as deep as 1,000 fathoms.

He was promoted to rear-admiral in 1939 and to vice-admiral in 1938 and placed on the retired list; but he continued in this rank for the next seven years, finally relinquishing his post as hydrographer in May 1945.

During his term of office, the need for better knowledge of the oceans was essential for submarine warfare, and an Oceanographic Section was set up

within the Hydrographic Department. With his usual foresight, he realized that Great Britain seriously lacked a centre for research in this subject, and in 1944 he opened discussions in the Admiralty which eventually blossomed, six years later, into the National Institute of Oceanography. After retirement from the Navy, he kept himself fully abreast of all developments and served on the National Oceanographic Council and Executive Committee of the Institute, where his counsels were highly respected. He attended his last committee meeting as recently as June of this year, after which his health began to fail.

For his services in command of surveying ships during the First World War he was awarded the O.B.E. in 1919. In 1936 he was made C.B., and was created K.B.E. in 1942.

But his proudest moment was when he was elected to the fellowship of the Royal Society in 1943.

Edgell was, from its beginning, very closely connected with the activities of the International Hydrographic Bureau and attended four of the quinquennial conferences at Monaco, and in 1939 was elected chairman of the Assembly.

Edgell was appointed by the Admiralty to the Board of the Port of London Authority in 1941, and held this post until his seventieth birthday and was nominated as the Authority's representative on the Kent River Board. He was selected to be the acting conservator of the Mersey on retirement as hydrographer until 1951.

Always a keen cricketer, Edgell lived an active life. Many were his tales of hard work and full enjoyment in his sea-going days, when there was no easy substitute for marching through rough country to make a triangulation station or pulling a whaler for weeks on end to sound out the shallow areas of a survey. He took a very personal interest in his officers and men and would always be forthcoming in giving advice and encouragement. His knowledge of hydrography was unlimited, and he had a flair for imparting his skill, while his memory never failed him for even the most precise point of detail.

He was the last of the old generation of surveyors who had been brought up on the tenets of Wharton and Field and the hard life that the early surveyors had endured.

E. G. IRVING

Prof. T. M. MacRobert

THOMAS MURRAY MACROBERT died at his home in Glasgow on November 1 at the age of seventy-eight. He held the chair of mathematics in the University of Glasgow from 1927 until 1954, and before that had been assistant and lecturer in the same University. He was educated at Irvine Royal Academy and the University of Glasgow, where he graduated in 1905 with first-class honours in mathematics and natural philosophy. From 1906 until 1910 he was a Major Scholar at Trinity College, Cambridge, and was a Wrangler in the Mathematical Tripos.

Prof. MacRobert was the author of numerous papers on the theory of special functions, on which he was an expert; he continued to be active in research until just before he died. Much of his work was concerned with the properties of E -functions; these functions, which were invented by him, contain as special cases several of the well-known functions of mathematical physics, and make it possible to give a unified treatment of the subject. His books on *Functions of a Complex Variable* (Macmillan, 1917)

and *Spherical Harmonics* (Methuen, 1927) were widely used by students, and he also collaborated with other writers in books on Bessel functions and trigonometry. He was responsible for the second revised edition of T. J. P. A. Bromwich's *Infinite Series* (Macmillan, 1926). The value and popularity of these works are attested by the number of different editions in which they have appeared.

He was a friend and helper, not only to generations of Glasgow students, but also to many mathematicians from India and the East, who will sorely miss the willing assistance he gave them in their work, without ever expecting any acknowledgment. He was one of the original founders of the Glasgow Mathematical Association, of which he was twice president and latterly honorary president. The flourishing state of the Association and the establishment and reputation of its *Proceedings* are very largely due to him.

His interests outside mathematics included hill-walking and playing the organ, and he took a prominent part in the preparation of the *Congregational Churches' Hymn Book*. The affection and respect in which he was held by friends, colleagues and former students was amply demonstrated when, after his retirement in 1954, they commissioned Mr. Norman Hepple to paint his portrait. This excellent likeness, which the University of Glasgow is fortunate to possess, also conveys something of his character and personality. He will be remembered for his kindness and unfailing courtesy, but above all for his absolute integrity.

R. A. RANKIN

Prof. E. F. Nash

PROF. ERIC NASH, professor of agricultural economics in the University of Wales, Aberystwyth, died on October 31, aged fifty-eight. He is survived by a widow, a daughter and a son.

Nash started his academic career with a first in Greats at University College, Oxford, went on to Modern Greats, in which he also took a first, and at one time seemed set for a career in pure economics (in 1930 he published *Machines and Purchasing Power*, which was an essay in monetary theory). But with his appointment to the Ministry of Agriculture in 1934 he turned his attention to agricultural economics, and most of his work was done in that subject either in that Ministry, the Ministry of Food, the Control Commission for Germany, or, since 1946, at Aberystwyth. At the time of his death he was among the two or three best-known agricultural economists in Great Britain. This was a reputation gained not through the volume of his published work (indeed, during his twelve years of Government service he was scarcely able to publish anything) but through the uniformly high quality of his articles, speeches, teaching and contributions to discussions and debates. He was much in demand as a speaker and member of committees (Government and other), and his services were borrowed for quite long periods by the authorities in Jamaica, who were concerned with the low state of agricultural development in that country. He had much to do there with the work of the Institute for Economic and Social Studies.

Nash had no special interest at any time in agriculture as an applied science. It is true that as provincial agricultural economist for Wales he had to devote himself to some extent to the practical problems of Welsh farming, especially on the farm management side, and that as a member of the