

IN MEMORIAM: DR J S G McCULLOCH

Dr J S G McCulloch (Jim), internationally recognized as a leader in developing the science of hydrology and strong supporter of the International Association of Hydrological Sciences, died on 15 September after a long illness, aged 86.

Jim McCulloch, who maintained strong roots in Scotland throughout his life, went to school at Nairn before reading physics at Edinburgh University. Moving to Rothamsted Experimental Station, part of the Lawes Agricultural Trust, he worked with Dr H L Penman FRS on soil physics and agricultural meteorology, obtaining a doctorate from the University of London together with relevant qualifications in meteorology and (later) statistics from the universities of London and Aberdeen. After National Service attached to the Ministry of Supply, he was appointed physicist at the East African Agricultural and Forestry Organization (EAAFRO) at Muguga, Kenya, to work with Dr Charles Pereira FRS, then head of EAAFRO's division of physics and statistics. The work of the division was to study factors affecting water yields of selected catchment areas in the three territories Kenya, Uganda and Tanzania (then Tanganyika). This important work was later published as a Special Issue of the *East African Agricultural Journal*, and provided an essential basis for the efficient use of water under East African conditions of soil and climate.

Following Kenyan independence, it was natural Jim McCulloch to move to Wallingford to take up the post of head of the Hydrological Research Unit (HRU), after its then head, Professor Eamonn Nash, had returned to his native Galway in 1964. The HRU that McCulloch inherited had a total staff of eight and was housed in an attic of the much larger and long-established Hydraulics Research Station (HRS) at Wallingford. Under his benign leadership, this small unit developed over the next 25 years to become an Institute of Hydrology with a total of 150 staff and to form an outstanding research institute of the Natural Environment Research Council (NERC). When Jim McCulloch retired, "IH" had a world-wide reputation for excellence in hydrological research and was a mecca for visiting hydrologists and water resources experts from all over the English-speaking world, Europe, Africa and South America. From IH's earliest days, Jim gave a home to the IAHS Press, with subsidised office space, office services and editorial support, ensuring where possible that terms of pensionable employment of IAHS personnel were equivalent to those of IH scientists.

The success of IH followed from McCulloch's policy of recruiting young scientists of proven ability in a range of disciplines relevant to hydrology, and then giving them a large measure of freedom to develop their science. At least eight of those appointed to IH in their twenties went on to take senior chairs in water sciences in the UK and elsewhere. IH scientists were always encouraged to develop links with practitioners which might lead to projects of commissioned research, at which IH was outstandingly successful. Catchment studies were set up in the UK to compare water losses by evaporation from forest and grassland, and UK-wide studies of extreme floods and droughts were extended more broadly to the European mainland, forming a template for

such studies elsewhere. Major initiatives on the relation between climate and hydrology led to international collaborations such as the Anglo-Brazilian Climate Observation Study (ABRACOS) which compared water losses from tropical rainforest at three widely-separated sites in the Amazon Basin, with the losses from nearby deforested areas; many other overseas projects were funded by the (then) Overseas Development Administration and consultant engineers. Under McCulloch's leadership, such studies greatly extended understanding of the underlying physical and chemical processes which was rigorously expressed in mathematical terms, leading to well-regarded physically-based models to predict consequences of land-use change on river flow and sediment transport (e.g. the *Système Hydrologique Européen*, SHE). Recognizing also that good measurements of hydrological processes were essential for the development of sound science, McCulloch placed great emphasis on the development of reliable instrumentation which included automatic weather stations for use in inhospitable climates, probes for measuring moisture content throughout a soil profile, and recording devices to log the measurements taken.

Although a benign leader to his staff members, and one strongly supportive in their personal lives as well as in their scientific development, Jim McCulloch was always ready to challenge vigorously any decision by NERC higher management and administration which he believed would adversely affect the development of hydrological science at IH. Furious rows were not uncommon, but his natural suspicion of higher-level managers and scientific administrators within the NERC (amongst whom, nevertheless, he also had many friends) did not prevent him from marrying Dr Christine Sunley, one of their number and a successful water scientist in her own right. Jim and Christine, always excellent hosts (particularly on Burns nights) at their converted water-tower overlooking the Thames, had a long and happy marriage blessed with two children: Richard, a civil engineer, and Caroline, a school teacher.

Jim McCulloch's efforts to further developments in hydrological science continued long after his retirement as Director of IH (the name, IH, disappeared under a re-organization of the NERC, under which IH was combined with parts of other institutes and renamed the Centre for Ecology and Hydrology, CEH). Having pressed for full recognition by the European Geophysical Society, EGS (now the European Geosciences Union, EGU) of the importance of hydrology in many fields of scientific endeavour, he became founding editor of the EGU journal *Hydrology and Earth System Sciences*, HESS, setting high standards for reviewing and editing of papers concerned with all aspects of water science and its relevance to all human activity. He was also a founding member of the British Hydrological Society. The warmth, idiosyncracies and sometimes maddening digressions of this remarkable man will be remembered with affection by hydrologists the world over.

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