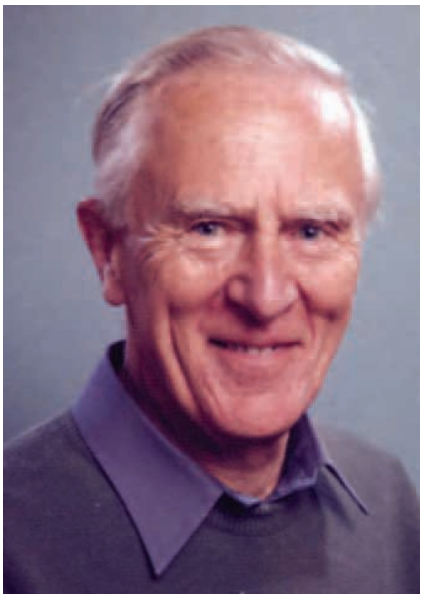
Douglas L Ingram

1929–2006



The death of Doug Ingram from cancer at his home in Whittlesford, Cambridge on 21 March marks the end of a unique scientist and human being. He had a tremendous love of science and lived life to the full. His research career spanned four decades during which time he made major contributions to the fields of reproductive physiology, thermal and environmental physiology, and nutritional and developmental physiology. Not only did his findings result in significant insight into fundamental biology but they also paved the way for current applications in biomedicine. He was extremely modest about his ability and achievements, frequently attributing major advances to his colleagues. Despite being a full-time research scientist, Doug also made time to help others – his knowledge and enthusiasm for science have been passed on to numerous students and colleagues world-wide.

The major part of Doug's research achievement occurred between 1961 and 1989 at the ARC Institute of Animal Physiology, Cambridge/BBSRC Babraham Institute, in the Departments of Applied Biology, Cell Biology, and Molecular and Cellular Physiology. He was a Member of The Physiological Society from 1963 to 2001. Doug was Visiting Lecturer and Research Fellow, Departments of Veterinary and Medical Physiology, University of California at Davis, USA (1968–1969), Lecturer in Climatic Physiology, Department of Biological Anthropology, University of Cambridge (1974–1997), Special Professor of Environmental Physiology, University of Nottingham (1981–1989), and Supervisor in Physiology (1969–1999) for undergraduates in Medical, Veterinary and Natural Sciences at Gonville and Caius College, Newnham College, Churchill College and Christ's College, University of Cambridge. He was a Member of the High Table at Christ's until March 2006.

Doug was always passionate about biology. He was born and brought up in Birmingham where the parks and small rivers provided early opportunities for discoveries about the natural environment. He shared with his father, a shoe-repairer, the intellectual curiosity and practical ability that are essential for success as a first-rate research scientist. Enlightened post-war policies on further education for those with academic ability but limited financial resources, together with a City of Birmingham Exhibition, enabled him to join his local university during a period of immense research achievement and leadership. He was an undergraduate in the Department of Zoology under Peter Medawar and then a PhD student in the Department of Anatomy under Solly Zuckerman. His studies on reproductive physiology were interrupted by a 2 year period of National Service as a Royal Air Force Education Officer, after which time he was awarded a 3 year MRC Research Fellowship to return to the University of Birmingham under Zuckerman. His work was concerned with the problem of atresia which causes a decline in the number of oocytes in the mammalian ovary. It provides the impetus for many current studies on germline stem cells and follicular renewal in the postnatal mammalian ovary; studies that have significant clinical implications with respect to ovarian failure.

Key aspects of environmental physiology, especially thermoregulation and adaptation to the thermal environment, formed the basis for the major phase of Doug's research career, first at the ARC Hannah Research Institute (1958–1961) and then at The Babraham Institute, Cambridge. He carried out many detailed investigations, often with co-workers, into the role of thermosensitive regions deep in the body and on the skin surface. His research was concerned with both behavioural and autonomic systems, such as blood flow and metabolism, and it was concluded that the control systems depend on the integration of signals from all over the body. At this stage he also initiated studies into interactions between nutrition and the thermal environment. The effects of changes in environmental conditions were investigated in relation to a range of variables such as sensible and evaporative heat loss and the quantity of food eaten, and demonstrated a striking interaction between behavioural thermoregulation and food intake.

These studies resulted in numerous publications in learned journals, including *The Journal of Physiology*, and joint publication of the definitive book on *Man and animals in hot environments*. This work continues to provide insight into fundamental mechanisms of thermoregulation. In the current environment of global climate change his contribution is particularly relevant to an understanding of the potential for homeostatic adaptation in all mammalian species. In recognition of his achievements, he was awarded Individual Merit Promotion to Senior Principal Scientific Officer in 1975, and a DSc by the University of Birmingham and elected a Fellow of the Institute of Biology in 1976.

The last 15 years of Doug's research career saw a remarkable period of scientific achievement. He did not seek high office but chose to continue in practical research, during which time he demonstrated unique ability as an integrative scientist. This research, with many colleagues, visiting scientists and students, highlighted his continuing flair for asking the right questions and the ability to answer them by developing new techniques. Of particular importance are studies on the influence of environmental temperature and energy intake on postnatal

development. Some environmentally and nutritionally induced changes were found to be at least as great as those determined by genetics and the underlying mechanisms involved physiological, biochemical, cellular and molecular modifications. His studies highlighted the role of the endocrine system, especially thyroid and growth hormones, in these responses. For example, it was found that temperature and energy intake influence thyroid hormone metabolism through separate mechanisms, and that the abundance of nuclear thyroid hormone receptors is determined by an interaction between thermal and nutritional factors. This research provided new insight into fundamental problems of growth and development and has led to increased understanding of the mechanisms by which early environment has both immediate and long-term effects on health and disease. When Doug retired from The Babraham Institute, the Director wrote about his impressive productivity and pioneering research since Individual Merit Promotion, and said 'As the march of science has been taking an ever more molecular path, it has been reassuring for me to know that some of our staff have continued a whole animal approach. In this regard I have always found your work both exciting and comprehensible. Especially revealing to my mind is the extraordinary phenotypic change brought about by ambient temperature differentials, surely a timely leveller for the almighty gene.'

Following formal retirement, Doug continued to demonstrate his love of science and desire to seek answers to the deeper questions about life. In addition to teaching undergraduates, he read widely and studied astronomy and cosmology at the Institute of Continuing Education, University of Cambridge. In his final year he showed tremendous courage in the face of deteriorating health. He continued to pursue his interests in philosophy, baroque music, sailing and walking, and enjoyed intellectual discussions with former colleagues and friends. A testimonial in 1955 stated 'He is a man of high intelligence, bright disposition of ideas and practical ability. His moral character is of the highest standard'. Numerous letters of condolence to his family provide continuing testimony: 'a truly good and kind man', 'I remember him with great affection as a boss who actually cared about those under his charge – he was tolerant, understanding and inspirational', 'a wonderful colleague and I always appreciated his advice and help on numerous occasions', 'we all liked Doug so much, and his quiet modesty belied his considerable achievements and international reputation in the scientific field.' Perhaps most of all Doug was a person of wonderful humanity and sense of fun. He is greatly missed and will not be forgotten; his legacy lives on through the wisdom and kindness he gave to his family, colleagues and friends.

Joy Dauncey
Fellow of Wolfson College, University of Cambridge

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