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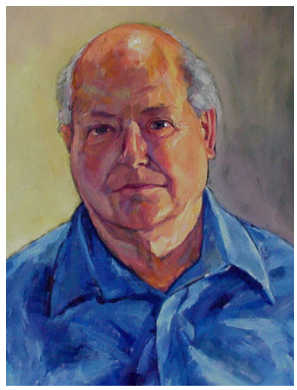
OBITUARY

Robin Holliday (1932–2014)

Leonard Hayflick



Robin Holliday, Ph.D., Fellow of the Royal Society and of the Australian Academy of Science was internationally known as a molecular biologist, cell biologist and biogerontologist.

Robin earned a B.A. in Natural Sciences and a Ph.D. in Genetics from Cambridge University in 1959. He was a member of the European Molecular Biology Organization, a Foreign Fellow of the Indian National Science Academy, and held the Lord Cohen Medal for Gerontological Research. He was formerly the Head of the Genetics Division, National Institute for Medical Research, Medical Research Council, Mill Hill, London, UK, and was a retired Chief Research Scientist, in Australia at CSIRO, the Commonwealth Scientific and Industrial Research Organization, Division of Bio-Molecular Engineering, Sydney, Australia.

Robin's several major scientific accomplishments include his 1964 proposal of a mechanism of DNA strand exchange to explain recombination during meiosis in fungi. This brilliant insight, later demonstrated to occur in the cells of higher organisms, became known as the Holliday Junction. In 1976, David Dressler and Hunt Potter published the results of a series of experiments in which the validity of the Holliday Junction was demonstrated.

In 1975 Robin suggested that DNA methylation could silence and otherwise control gene expression. Later, this was experimentally demonstrated as a fundamental epigenetic phenomenon and established Robin as a founder of what is now the popular field of epigenetics.

Robin was one of the pioneers in research on the cell biology of aging. His interest was stimulated in the early 1960s when he read my papers showing that, unlike cancer cells, cultured normal human cells have a finite replicative capacity. He was intrigued by my suggestion that this could be a manifestation of cellular aging and that normal cells retain a memory of their replication numbers.

Robin was also influenced by his friendship with the late distinguished molecular biologist, Leslie Orgel of the Salk Institute, La Jolla, CA, who proposed the "Error Catastrophe" hypothesis of aging. This

L. Hayflick (✉)
Department of Anatomy, University of California, San Francisco, P.O. Box 89, The Sea Ranch, CA 95497, USA
e-mail: lenh38@aol.com

suggested that a feedback of errors within the cell's protein synthesis pathways could lead to cellular breakdown and thereby contribute to organismal aging. Although Robin's tests of this hypothesis were negative, he pioneered research on how errors in macromolecules might be important for aging.

At this time research on the cell biology of aging was virtually non-existent. It was a backwater where only a handful of reputable scientists worked. The scientific mainstream avoided research on the biology of aging because it was considered to be intractable and to pursue it was tantamount to committing professional suicide. It was also ignored because of its encirclement by a lunatic fringe that had been present for centuries and still to this day.

The field was dominated then by descriptive research and geriatric medicine. Little research was directed toward efforts to understand why biological aging occurs, which sadly, is currently still unchanged.

Robin, who was by now becoming well known for his discovery of the Holliday Junction, became a magnet for recruits to the field of aging research. I imagine that this occurred because of Robin's stature as a leading scientist who, by embracing the field, lent legitimacy for others who might be interested in conducting research on the fundamental biology of aging.

Robin arrived at the Medical Research Council, National Institute for Medical Research, Mill Hill, London, UK, in 1965. Coincidentally, I was invited to Mill Hill in that year where I met the Director, Sir Peter Medawar who was familiar with my work.

In evaluating Robin as Head of the Genetics Division one referee that Medawar consulted wrote, "There can be no doubt of [his] ingenuity and enterprise … He must be making more progress with the study of replication and recombination than virtually anyone else".

In 1970 Robin was appointed Head of the Genetics Division. Three years later Medawar wrote that Robin had "added to his reputation by his more recent work on DNA repair mechanisms and by his exciting experiments in the field of senescence."

It was as head of the Genetics Division that he collaborated with younger researchers who became leading scientists in the field. These include Drs. Thomas Kirkwood, Director, Institute for Ageing and Health, Newcastle University, UK and Robin's former graduate student, Suresh Rattan, Aarhus University, Denmark, and Editor-in-Chief of this journal. It was Robin who introduced Kirkwood to the late John Maynard Smith, whose genius for evolutionary thinking inspired Kirkwood to propose the "Disposable Soma Theory of Ageing" which became a significant contribution to our understanding of biological aging. Such making of introductions was characteristic of Robin's generosity to younger colleagues.

In 1973 Robin accepted Dr. Zhores Medvedev in his laboratory. Medvedev, a well-known Russian pioneer in the molecular biology of aging, had succeeded in obtaining a long sought visa from the Soviet Union for him and his wife to attend a conference in London. Because of his years of criticism of the USSR government, a ruse by their London embassy resulted in the loss of his passport. Now left stateless, Robin and I offered Medvedev a position in our laboratories. Medvedev chose Robin's offer because of its closer proximity to his home and remaining family in Moscow.

In 1988 Robin moved to the CSIRO laboratory in Sydney, Australia, where he continued to study the biology of aging as Chief Research Scientist, in the Division of Bio-Molecular Engineering.

A polymath, Robin had a consuming interest in sculpture starting in the 1960s when he attended classes at the Camden Art Centre in London. He was influenced by the established British school of abstract sculpture, particularly Henry Moore and Barbara Hepworh, among others. He has been quoted as saying, "My work is mainly abstract, but I sometimes bridge the gap between representational forms and abstract ones. This is in part due to the influence of organic shapes on my sculpture."

Robin produced his first bronze sculptures in 1998. One called "The Double Helix" is displayed at the Laboratory of Molecular Biology in Cambridge, UK, and another at the Royal Society, London. His bronze mobile "Homage to Newton" is also at the Royal Society.

Robin's research has contributed significantly to our understanding of the fundamental biology of genetic recombination, genetic repair, gene expression, and cellular aging. In addition to his more than 250 scientific papers, he wrote several books, including The "Science of Human Progress" (1981), "Genes, Proteins and Cellular Ageing" (1986), "Origins and Outcomes" (his autobiography),

"Understanding Ageing" (1995), and "Aging: The Paradox of Life: Why We Age" (2007).

The latter two are tours de force in which Robin reveals several of his remarkable insights into our understanding of the fundamental biology of aging. Reading these books will not only benefit new students in the field but will also add to the knowledge of established investigators.

On November 5, 2014, in Washington, D.C. and prior to the annual meeting of the Gerontological Society of America, Robin was an invited speaker at a conference on "The Second Law of Thermodynamics and the Etiology of Biological Ageing". The conference and the resulting publication will be dedicated to Robin's memory.

Robin leaves his second wife, Lily and their daughter Mira and his first wife Diana and their children, David, Caroline, Rebecca, and Emma.

Those who have had the good fortune to know Robin Holliday as a friend will have had their lives enriched in many ways by this experience. Those who have had the good fortune to know him as a colleague will have received the gift of interacting with one of the most brilliant scientific minds of the modern era. He will be missed by all those who benefitted from knowing this uncommon man.

(Portrait of Robin Holliday by Eva Chant, oil on canvas, 2008)