

Topic Page: [Cairns, John \(1922 - 2018\)](#)

Summary Article: **Cairns, Hugh John Forster (1922-)**

From *The Hutchinson Dictionary of Scientific Biography*

Place: United States of America

Subject: biography, biology

English virologist known for his research into cancer.

Cairns was born in Oxford on 21 November 1922, the son of Professor Sir Hugh Cairns, a physician and fellow of Balliol College, Oxford. He attended Edinburgh Academy from 1933 to 1940, when he went to Balliol and gained his medical degree in 1943. His first appointment was in 1945 as surgical resident at the Radcliffe Infirmary, Oxford, and the next five years were spent in various appointments in London, Newcastle, and Oxford. From 1950-51 Cairns was a virologist at the Hall Institute in Melbourne, Australia, and he then went to the Viruses Research Institute, Entebbe, Uganda. In 1963 he became director of the Cold Spring Harbor Laboratory of Quantitative Biology in New York, a position he held until 1968. He then took professorships at the State University of New York and with the American Cancer Society. From 1973-80 he was in charge of the Mill Hill Laboratories of the Imperial Cancer Research Fund, London. He then moved to the USA to become professor of microbiology 1980-91 at the Harvard School of Public Health, Boston. He retired in 1991.

One of Cairns's first pieces of research in the early 1950s was into penicillin-resistant staphylococci, and their incidence in relation to the length of a patient's stay in hospital. He found that the rapid rise in their incidence was caused by continuous cross-infection with a few strains of the bacteria rather than repeated instances of fresh mutations. These findings are now generally accepted, although they were not at the time.

Cairns has also done much research on the influenza virus and in 1952 discovered that the virus is not released from the infected cell in a burst- as is a bacteriophage - but in a slow trickle. This evidence has since been found also to be true for the polio virus. In the following year he showed that the influenza virus particle is completed as it is released through the cell surface (also unlike a phage). This discovery has since been confirmed by electron microscopy and isotope-incorporation techniques. In 1959 Cairns succeeded in carrying out genetic mapping of an animal virus for the first time. In 1960 he showed that the DNA of the vaccinia virus is replicated in the cytoplasm of the cell (rather than in its nucleus) and that each infecting virus particle creates a separate DNA 'factory'.

Cairns's investigations into DNA have also led him to look at the way that DNA replicates itself and to compare the rates of replication of DNA in mammals with those in the bacterium *Escherichia coli*. He has found that mammalian DNA is replicated more slowly than that of *E. coli*, but is replicated simultaneously at many points.

His later work studied the link between DNA and cancer, some forms of which may be caused by the alkylation of bases in the DNA. He showed that bacteria are able to inhibit the alkylation mechanism in their own cells, and later demonstrated this ability in mammalian cells. A similar mechanism probably prevents a high incidence of DNA mutations in human beings despite the presence of alkylating agents in the environment.

Cairns made many important advances in the study of cancer and its relation to society. He has also spent much time in fundraising for cancer research, and has written popular books and articles on cancer and public health.

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