



## In memoriam

## Maurice Green – A pioneering virologist

Maurice Green (born May 5, 1926), one of the founding fathers of the field of tumor virology, passed away on December 5, 2017. Maurice was a remarkable scientist with a highly productive career that spanned six decades and that yielded over three hundred publications. An active researcher until the very end, his passing at age 91 occurred the week after acceptance of his latest manuscript for publication (in *Genes & Cancer*).

Maurice was born and raised in New York City, the oldest of three siblings. After graduating high school in 1944, he served in the U.S. Navy. He often said that his love of science derived from the reading he did while on military service to stave off boredom. He went on to earn a B.S. degree in Chemistry from the University of Michigan, Ann Arbor in 1949, and then M.S. (1952) and Ph.D. (1954) degrees in Biochemistry and Chemistry from the University of Wisconsin, Madison. He then pursued postdoctoral research training at the University of Pennsylvania School of Medicine, serving as an Instructor of Biochemistry from 1955 to 1956.

In 1956, Maurice joined the faculty of Saint Louis University School of Medicine as an Assistant Professor in the Department of Microbiology, becoming Associate Professor in 1960 and then Professor in 1963. In 1964, he became Professor of Molecular Virology and Founding Chairman of the Institute for Molecular Virology. In 2016, the Institute became a division within the Department of Molecular Microbiology and Immunology.

Maurice was among the first to develop and apply the emerging concepts of molecular biology by studying the biochemical features of virus replication in cell culture. His earliest work was directed towards understanding the parameters of human adenoviral infection and the characterization of adenoviral serotypes. He went on to study adenoviral gene expression at the RNA and protein levels. These studies took on special importance when in 1962, it was shown that human adenovirus could induce tumors in newborn hamsters (Trentin et al., 1962; Huebner et al., 1962). This finding was of intense practical importance because the military was using live adenoviruses as vaccines against adenovirus-induced acute respiratory disease. Maurice's classic studies not only demonstrated that adenovirus was not a factor in human cancer (McAllister et al., 1972; Green and Wold, 1976, 1983; Mackey et al., 1976), but also established adenoviruses as a powerful model system that has since been used to address more global questions about virus replication, human cell molecular biology, infection and immunity, and neoplastic cell transformation.

In subsequent years, the study of adenoviruses has provided key insights into tumor suppressors, cell proliferation, pre-mRNA splicing, and the host immune response. Adenoviruses also emerged as a vehicle for human gene therapy. In 1966, Maurice showed for the first time that transformed cells express adenovirus-specific RNA, and thereby established the principle that adenoviruses transform cells through continuous expression of their genes rather than by a 'hit-and-run' mechanism (Green, 1970). Maurice went on to make many other contributions to adenovirus molecular biology. He contributed to the discovery of two of the proteins required for adenoviruses to transform cells, and this finding played a key role in further establishing adenovirus as an experimental system, attracting other research groups and producing many important discoveries (Gilead et al., 1976).

During his career, Maurice investigated the molecular virology of other tumor viruses, including Epstein-Barr virus, human polyoma viruses, RNA tumor viruses, and human papilloma viruses. The scientific community was not aware, at that time, of the potential of human hepatitis viruses to cause cancer. His laboratory's efforts were part of President Richard Nixon's "War on Cancer". His carefully conducted studies argued strongly against a viral etiology of many human cancers. One exception was his detection of papillomavirus DNA in urogenital cancers (Green et al., 1982). Later, his research also extended to RNA tumor viruses leading to important studies on the biochemical features of reverse transcriptases found in avian and murine retroviruses that revealed the subunit structure of the enzyme and helped define its polymerase and ribonuclease H activities.

In recent years, Maurice's efforts were directed at understanding the multifunctional adenovirus oncoprotein E1A. He was among the first to demonstrate that individual functional domains within E1A are independent, an observation that has since been exploited by many laboratories studying regulatory proteins. He was most interested in the 80-amino-acid E1A N-terminal transcriptional repression domain and its role in adenovirus cell transformation. Most recently, his laboratory exploited the E1A N-terminal domain's ability to enhance MYC association with the NuA4 complex to study MYC-associated tumorigenesis.

Maurice's extraordinary research program has been fundamental to the fields of virology and molecular biology. His contributions have served to illuminate fundamental aspects of virus biology, transcriptional regulation, and mechanisms of oncogenesis.

Maurice's death followed that of his wife of 60 years, Marilyn (Glick), in 2010. He is survived by their three children: Michael Green, M.D., Ph.D. (Howard Hughes Medical Institute Investigator, Director of the University of Massachusetts Medical School Cancer Center, and Chairman of the University of Massachusetts Medical School's Department of Molecular, Cell, and Cancer Biology); Wendy Green Lee, M.D. (a pediatrician); and Eric Green, M.D., Ph.D. (Director of the National Human Genome Research Institute, National Institutes of Health). Maurice is also survived by three granddaughters and two grandsons.



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