

# Alex Hollaender: Renowned geneticist and scientific director

(As published in The Oak Ridger's Historically Speaking column on March 22, 2017)

Carolyn Krause brings us a two-part series on an early Oak Ridger who enjoyed the Cumberland Mountains, fossils and most of all was a renowned scientist who was brought here for a singular purpose - to create a Biology research facility second to none. And that is exactly what he did. Enjoy the results of Carolyn's research.

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Alexander Hollaender (1898–1986) was the founder and first director of the Biology Division of what became Oak Ridge National Laboratory. He was a radiation biology pioneer, a productive geneticist, a recruiter of brilliant scientists who made up a world-class division and an innovative scientific administrator.

Under his leadership from 1946 to 1966, the Biology Division became ORNL's largest division and one of the world's strongest centers of basic biology. Over time it was internationally recognized for its contributions to radiation genetics, biochemistry, radiation carcinogenesis and molecular biology.

A native of Germany, Hollaender became renowned both locally and nationally. Hollaender earned his Ph.D. degree in physical chemistry at the University of Wisconsin. In 1968, he was awarded a Fin sen Medal at the Fifth International Congress of Photobiology. In 1983 he received the Enrico Fermi Award, the Department of Energy's highest honor. And in 1984, he was a recipient of the National Medal of Science.

"He "made superior contributions in three different fields of endeavor – scientific discovery, scientific education and scientific administration," wrote Richard B. Setlow, who conducted research at ORNL's Biology Division and then became an associate director at Brookhaven National Laboratory.

During 1946-47, Eugene Wigner, a pioneering nuclear reactor designer and future Nobelist, was co-director and research director of Clinton Laboratories, which morphed into ORNL a year later. Wigner knew the Atomic Energy Commission was planning a nuclear energy future, from nuclear power reactors to nuclear weapons.

As a result of atmospheric testing of detonated nuclear weapons, world leaders expressed concern about the health effects of radioactive fallout on exposed people and their descendants. Wigner saw the need for basic research to determine the effects of radiation on cells and to predict its effects on human health and offspring.

Wigner, a native of Hungary, hired Hollaender in 1946, and Hollaender and his wife Henrietta moved to Oak Ridge in 1947. By the end of the year, Hollaender hired a couple who became top-notch geneticists, William L. and Liane B. Russell. He was the first director to hire a married couple. (Other married couples that worked in the Biology Division included the Setlows, the Generosos, the Niyogis and John Cook and his wife Dorothy Skinner.)

At the time Hollaender had not yet been recognized as one of the world's leading researchers in radiation biology and genetic mutations. In 1939 at the U. S. Public Health Service in Bethesda, Md. (which became part of the National Institutes of Health), Hollaender had coauthored a landmark paper indicating that nucleic acids, not proteins, form the building blocks of genes.

With Esther Zimmer and Milislav Demerec, Hollaender induced mutations in spores of a ringworm fungus using ultraviolet radiation. They found the mutations occurred in the same spectrum as the absorption spectrum of nucleic acids.

In the July 1996 edition of the journal *Genetics*, former ORNL researchers R. C. (Jack) von Borstel and Charles M. Steinberg wrote in their essay "Alexander Hollaender: Myth and Mensch,"

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"In retrospect, it is clear that Hollaender fired one of the first shots in the molecular biological revolution."

According to Wikipedia, Hollaender's "research was not appreciated for its discovery at the time, and later scientists' reports were necessary before science accepted the role of nucleic acids as the genetic material. Historians of science now realize his early discovery," which the Department of Energy (AEC's successor agency) recognized in 1983 by honoring him with the Fermi Award.

Hollaender's other major scientific contribution, according to von Borstel and Steinberg, had to do with the "oxygen effect." Hollaender recognized the possibility of practical applications of the earlier discovery that "most of the biological effects of ionizing radiation are dramatically reduced in the absence of molecular oxygen."

In the 1950s he pushed ORNL biologists to study organic "radical traps" as a possible way of protecting against the effects of ionizing radiation. The potential of antioxidants to reduce the cellular damage induced by ionizing radiation has been studied in animal models for more than 50 years.

Von Borstel and Steinberg, who wrote their 1996 essay on Hollaender from the Basel Institute for Immunology in Switzerland, stated that Hollaender "achieved greatness" as founder and first director of the Biology Division, which had as many as 200 doctoral-level scientists, and as an "impresario" and "organizer of science." They credited Hollaender with rearing "a Biology Division devoted to basic research that was larger than those (divisions) at Brookhaven, Argonne and Los Alamos combined." They called Oak Ridge "a great place to do basic research."

Organizing symposia became Hollaender's "preferred method of biotechnology transfer to the second and third worlds," they wrote, "and he continued doing it to the end of his life. He personally initiated more than 40 such symposia after his retirement as director of the Biology Division." The Fermi Award cited him "for his contributions in founding the science of radiation biology, and for his leadership in promoting scientific exchanges between American scientists and scientists from developing countries."

In 1981 Hollaender established the Council for Research Planning in Biological Sciences. While serving as its president, he died in 1986 from a pulmonary embolism. Every three years the U.S. National Academy of Sciences bestows on a scientist the Alexander Hollaender Award in Biophysics in his honor.

At Hollaender's retirement from ORNL in 1966, then ORNL Director Alvin Weinberg assessed Hollaender's career, which extended beyond his specific accomplishments to a new way of thinking that transformed and enriched both the laboratory and the biological sciences: "Alex Hollaender invented a new style of biological investigation: the melding of enormous, expensive mammalian experiments with basic investigations on a much smaller scale in which the principles underlying the mammalian experiments could be demonstrated and tested in the most delicate and far-reaching way."

"It is this unique combination of the big and the small, the mission-oriented and the discipline-oriented, that is Alex Hollaender's great contribution to biomedical science. It is a contribution that has forever changed biology."

NEXT: Carolyn will bring us the recollections of Alex Hollaender by a former ORNL director and four former Biology Division staff members

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Alexander Hollaender, Oak Ridge National Laboratory's first Biology Division Director



Bill and Liane Russell, among the first Biologists hired by Alexander Hollaender