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ALEXANDER HOLLAENDER
1898–1986

A Biographical Memoir by
RICHARD B. SETLOW

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BY RICHARD B. SETLOW

ALEX HOLLAENDER WAS A GREAT MAN—really, four great men—because he made tremendous contributions in four different areas: science, administration, education, and scientific planning. Though these areas are separate ones, they were intertwined at different levels during four phases of Alex's life. The existence of these phases is a tribute to him in that he deliberately and effectively moved from one phase to another as a business man, a student and a practicing scientist, an administrator and educator, and a scientific planner. What he said in a late-life paraphrase was, "Whatever you do, do not set aside parking spaces for administrators. They are not important. Keep the spaces for the scientists, they are the important ones."

Alex was born in Samter, Germany. His family was in business. He traveled to the United States in 1921, settling with an uncle in Birmingham, Alabama, before traveling throughout the country. He visited St. Louis, Missouri and there met Henrietta Wahlert, whom he married in 1925. At her urging he became a naturalized citizen in 1927. Taking her advice, he entered the University of Wisconsin, where he received a bachelor's degree in 1929, a master's degree in 1930, and a Ph.D. in 1931, at age 33.

His early research dealt with the interaction of light and molecules and he brought to the field of photobiology a high standard of quantitative excellence. His first application was to the field of mitogenetic radiation, described by researchers in the Soviet Union as small amounts of ultraviolet radiation, given off by dividing cells, which triggered nearby nondividers to enter mitosis.

He published a paper on the subject (1931) and actually visited the Soviet Union to learn the details of the procedure. Upon returning to the United States he continued working on mitogenetic radiation in collaborations with many others until by 1937 there were close to 1000 publications on the subject. However, most of the results were inconsistent and inconclusive and led to publications in 1936 (a 40 page description and summary) and 1937 (concluding that mitogenetic radiation could not really be demonstrated.) Sporadic articles on the topic were published in the Soviet Union through 1950.

While at Wisconsin, Alex's extensive interests in the effects of ultraviolet radiation, supported by a National Research Council project, led to experiments that indicated the possibility that cells could recover from the effects of radiation (1935). This possibility, really a hint, led many years later to researchers, including Alex, finding evidence for DNA repair following exposure to ionizing radiation. Those findings are extensively described in volume 5 (1975), *Molecular Mechanisms for Repair of DNA,* parts A and B, edited by P. C. Hanawalt and R. B. Setlow, in a series of articles in *Basic Life Sciences*, published by Plenum Press, for which Hollaender was the general editor. He wrote the forward and included the 1935 article mentioned above, giving it an additional title "An Early Suggestion of DNA Repair."

Alex was also very interested in the lethal and mutagenic effects of monochromatic ultraviolet radiation on cells called

dermatophytes. He published two papers in 1939 on the subject "The Action of Ultraviolet Radiation on Dermatophytes. I. The Fungicidal Effects" in the *Journal of Cellular and Comparative Physiology* and "II. The Mutations Induced by Exposures to Monochromatic Radiation" in the *American Journal of Botany*. The latter results were extended and summarized in 1941 by Hollaender and Emmons as indicating that the molecules affected by the radiation had absorption spectra similar to nucleic acids and not to proteins. In 1941 nucleic acids were not really known to be genetic material. This result was the first clear indication that radiation and environmental biologists should concentrate on changes in DNA and not in proteins.

It is difficult at present, with our modern sophistication in biology, to recognize that Alex anticipated most of what is now spoken of as DNA damage and its repair and the relevance of such measurements to human ill health. Alex's ingenious experiments led to his appointment in 1937 as an associate biophysicist in the Washington Biophysics Institute of the National Institutes of Health. From 1940 to 1945 he was a civilian in the Office of Scientific Research and Development, Office of the Surgeon General of the U.S. Navy. Alex's clear and extensive research on radiation effects and his association with scientific organizations in Washington, D.C., led to his appointment from 1946 to 1966 as the director of the Biology Division of the Oak Ridge National Laboratory in Tennessee.

I first met Alex in 1955 when he visited Yale University, where I was on the physics and biophysics faculties. He gave a lecture on radiation biology and the Biology Division at Oak Ridge. We chatted, and I remember him saying clearly that I had to learn more biology, but that I could never learn it at Yale. However, if I came to Oak Ridge, they would teach me. I laughed inwardly at his presumption, but in actual fact

he was right. The Biology Division at Oak Ridge was really Hollaender's creation. He was able to build it into one of the best groups of biologists in the country by following certain very simple rules that most people ignore: (1) Tell people that their only security is their own productivity. (2) Try pushing people around. If they push easily, they deserve to do what you tell them to do; if they don't, they can work on their own. (3) Let them have enough money to spend. (4) Be one step ahead of other administrators.

At this point Hollaender wins hands down.

He had assembled in the division a magnificent group of young investigators. As a good approximation, they all were able to work without worrying about money. It was a Mecca for investigations into modern biology. Alex worked hard and took care of the funding. He was always in close contact with the source, the U.S. Department of Energy. Alex recognized, from his research and the work of others, that genetics was the cornerstone of modern biological research and he built the division on that foundation and on the structure and functions of nucleic acids.

Oak Ridge was the place to work. I regret that I did not realize it earlier. Going there in 1960 permitted me to spend full-time at research without any other worries. If I wanted to know something, I could get the answer by asking someone in the division. The 1950s and 1960s were times of growing financial assistance for scientific research. One might assume that Alex just rode the wave. I do not believe that; actually, he and his division made most of the waves, because the division was one of the most eminent biology organizations in the world. People came from everywhere to do research and to learn. It was an exciting place to be. Alex had organized it and was justifiably proud of it.

Alex was always thinking of ways to keep the division young and vibrant. He recognized that education was a key

to this effort. He took three important steps in the educational process. The first was the organization and conduct of symposia, usually once a year, in South America to help transfer scientific knowledge from the developing to the less developed portions of the world. The participants in the symposia were primarily scientific members of the Biology Division, all of whose expenses were paid by funds raised by Alex. These symposia used the extensive expertise of Oak Ridgers and were instrumental in binding science in South America to science at Oak Ridge.

The second step was the creation of two professional societies. He was one of the driving forces behind the formation of the Radiation Research Society in 1952 (president in 1954) and the leading force in the formation of the Environmental Mutagen Society in 1970 (president, 1970-1971, 1911-1972). The two fields obviously would have existed without Alex, but he had a major role in catapulting them to prominence and in the case of the Environmental Mutagen Society, gaining the interest and active support of numerous industrial firms.

The third and most important educational development at Oak Ridge was the formation of the University of Tennessee Oak Ridge Graduate School of Biomedical Sciences. The school in the Biology Division has kept the division intellectually alive and was, and is, tangible evidence of Alex's lifelong interest in students, especially minority students.

Alex was a superior scientist, for which he was elected to the National Academy of Sciences in 1957, and was given many national and international citations, including the Finsen Medal in 1968, the NAS Award for Environmental Quality in 1979, the honorary presidency of the 3rd International Congress of Environmental Mutagenesis in Japan in 1970, and the Enrico Fermi Award of the Department of Energy in 1983.

He was the principal editor of a number of large scientific volumes: *Radiation Biology* (three volumes, 1954,1955,1956; *Radiation Protection and Recovery, Chemical Mutagens Principles and Methods for Their Detection* (six volumes); and *Genetic Diversity in Plants*. The magnitude of these efforts is indicated by the following description of *Radiation Biology*, published by McGraw-Hill: "Volume I, Ionizing (high energy) Radiation, 18 chapters , 1265 pages; Volume II, ultraviolet radiation, 14 chapters, 595 pages, including-a 65-page chapter by Zelle & Hollaender on "Effects of Radiation on Bacteria;" Volume III, visible and near-visible light, 15 chapters ,765 pages." A clear indication that Alex recruited superior scientists to work in the Biology Division is the fact that including Alex, seven members of the division, beginning in Alex's time through 2001, were elected to the National Academy of Sciences.

Alex's appointment as director of the Biology Division ended in 1966. He remained in Oak Ridge and was a senior research adviser to the division from 1967 to 1973. In 1968 he became the director of the archives of radiation biology of the University of Tennessee in Knoxville, and from 1970 to 1978 he was a consultant to the Department of Energy.

After he left Oak Ridge in 1973, Alex fulfilled one of his long-term goals: to work in planning in biology. He set up the Council for Research Planning in Biological Sciences with its office on the premises of Associated Universities in Washington, D. C. Associated Universities had been operating Brookhaven National Laboratory since the lab's founding in 1946. There were extensive interactions between the biology and medical departments and the council. He looked to the future and started a series of books on genetic engineering and organized symposia throughout the world on many subjects, among which were biological production of energy, genetic engineering of micro-organisms for chemicals, sister chromatid exchanges, and more recently, genetic engineering

of animals. He helped universities develop new and innovative programs and worked untiringly at raising money for these symposia. He was good at this aspect, in part, because he never gave up when he knew he had a good idea. It was impressive to see him overcome any opposition by way of his own tenacity. If he did not get the money the first time he visited, say, the National Science Foundation, he would go a second time and a third time until finally, just to be rid of him, the NSF would provide enough money to start funding a symposium. Add a number of agencies to this list. Upon his death in 1986, he left funding to the Biology Department of Brookhaven lab to support students. That funding continues to this day.

In summary, Alex Hollaender did science, science administration, and planning from 1930. During that time, he accumulated a fantastic fund of information and knowledge about the subject and the people that do it. We look with awe on his accomplishments, and the energy and vision that he had in carrying them out. There is no question that his work will continue, but it will take much more that one person to do it. He was an optimist. He never gave up.

That is a lesson for all of us.

SELECTED BIBLIOGRAPHY

1931

With E. Shoeffel. Mitogenic rays. *Q. Rev. Biol.* 6:251-222.

1935

With J. T. Curtis. Effects of sublethal doses of mono-chromatic ultraviolet radiation on bacteria in liquid suspension. *Proc. Soc. Exp. Biol. Med.* 33:61-62.

1936

Biological effects of radiation: The problem of mitogenetic rays. In *Biological Effects of Radiology*. ed., B. M. Duggar, pp. 919-959. New York McGraw-Hill.

1937

With W. D. Claus. An experimental study of the problem of mitogenetic radiation. *Bull. 100*, National Research Council, National Academy of Sciences, Washington, D. C.

1939

With C. W. Emmons. The action of ultraviolet radiation on dermatophytes. I. The fungicidal effect of monochromatic ultraviolet radiation on the spores of Trichophyton mentagrophytes. *J. Cell. Comp. Physiol.* 13:391-402.

With C. W. Emmons. The action of ultraviolet radiation on dermatophytes, II. Mutations induced in cultures of dermatophytes by exposure of spores to monochromatic ultraviolet radiation. *Am J. Bot.* 26:467-475.

1941

With C. W. Emmons. Wavelength dependence of mutation production in the ultraviolet with special emphasis on fungi. *Cold Spring Harb. Sym.* 9:179-186.

1954

Preface. In *Radiation Biology*, vol. I, parts 1 & 2, ed. A. Hollaender. New York: McGraw Hill.

High Energy Radiation, vol, I. In *Radiation Biology*, ed. A. Hollaender. New York: McGraw Hill.

1955

Ultraviolet and Related Radiations. Vol. II In *Radiation Biology*, ed. A. Hollaender. New York: McGraw Hill.

With M. R. Zelle. Effects of radiation on bacteria. In *Radiation Biology,* vol. II. ed. A. Hollaender, pp. 365-430. New York: McGraw Hill

1956

Visible and Near-visible Light. Vol. III. In *Radiation Biology*, ed. A. Hollaender. New York: McGraw Hill.

1971

Chemical Mutagens, Principles and Methods for their Detection. Vols. 1-2. ed. John Costlow. New York: Plenum Press.

1973

Chemical Mutagens, Principles and Methods for their Detection. Vol. 3. ed. A. Hollaender. New York: Plenum Press.