David P. Rall, 1926–1999

As a scientist, administrator, and diplomat, David P. Rall pioneered the effort to identify and understand the elements that make up the human environment and their consequences for human health. As an intellectual and aggressive activist, he educated scientists, governments, and the world community to the critical need to address the existence of environmental agents and their consequences for human health. As a leader he marshalled some of the best minds and hearts of his time to the cause of world health through a safe and clean environment. And as a visionary he provided the goals of environmental health science and the direction to guide both current and future generations. His death on September 28 brought to a close a chapter in the evolution of our understanding of the interconnectedness of human health and the environment, a chapter he was largely responsible for writing

Rall, who was director of the NIEHS from 1971 to 1990, began *EHP* as an experimental journal in April of 1972 to provide a forum for the exploration of the perspective of basic research on environmental health. Just as his impetus created the momentum that has carried *EHP* forward in its effort to provide environmental health information to the world, thus did Rall provide the vision and leadership to propel environmental health science from its inception to its emergence as a major scientific discipline.

A native of Naperville, Illinois, Rall received his undergraduate degree from that city's North Central College in 1946. He received a Ph.D. in pharmacology and an M.D. degree from Northwestern University in Evanston, Illinois. He began his research career as a scientist at the National Cancer Institute (NCI), where he served in a variety of research and administrative positions until 1971. Rall also served as a surgeon (1955–1959), senior surgeon (1959–1969), medical director (1963–1971) and assistant surgeon general (1971–1990) in the United States Public Health Service (PHS). Rall authored over 100 publications in the areas of comparative pharmacology, cancer chemotherapy, the blood–brain barrier, pesticide toxicology, and drug research and regulation.

By the early 1970s, political, social, and scientific forces combined to direct Rall toward what many consider to be the most significant work of his career, the development of the NIEHS. The late Irving J. Selikoff, professor emeritus at the Mount Sinai Medical Center, described the evolution of scientific thinking that preceded the development of environmental health science:

> Hints began to appear that exogenous agents, generally inorganic, such as metals, dust, chemicals, might be responsible [for disease] and that such influence could be identified, understood, and, perhaps, that information used for prevention and management. Around 1970, both the scientific and general community began to consider that cancer, in almost all cases, was the result of environmental factors and was thereby not necessarily inevitable and potentially preventable.

In response, as former Rall colleague John Moore states:

> [P]eople began to view their environment as something they shared with the rest of the members of the ecosystem. . . . Although little was definitely known at the time, a nation began to ask itself some environmental questions and to appreciate the need for answers to legitimate concerns.

As these questions and concerns arose, a nation was confounded by its inability to obtain answers due to the lack of scientific information available concerning the effects of various agents on human health and the environment. In response, in 1961 the PHS Committee on Environmental Health Problems recommended the establishment of a national center to undertake integrated research and other activities related to environmental health. This center became the forerunner of the NIEHS.

In March of 1971, Rall left the thriving, established world of research and clinical treatment at the National Institutes of Health's (NIH) main campus in Bethesda armed with a desire to reach beyond the treatment of chronic disease to seek its underlying causes and, through research, to learn how to prevent such diseases caused by environmental agents. Rall arrived in the newly established Research Triangle Park in North Carolina, where he set about the work of conceptualizing and then actualizing a state-of-the-art research facility among the pine forest and pastureland of the area, a prescient move that would situate the institute at the epicenter of what would become an internationally renowned research commons.

The NIEHS was entrusted with the principal responsibility among federal agencies for the support of research and the training of scientists concerned with the effects of chemical, physical, and biological factors on human health. A vigorous Intramural Research Program evolved at the institute to study the biological effects of environmental agents. In the early 1970s, NIEHS scientists conducted some of the important early studies of aromatic hydrocarbons such as polychlorinated biphenyls, dibenzodioxins, and dibenzofurans, among others. Major studies on heavy metals in the environment were soon conducted, as were studies of specific target organs and how they were affected by environmental contaminants.

The success of these programs was made possible by Rall's talent in assembling the best and brightest minds he could find to perform the research and then leading by the example of his own dedication to environmental health science. This ability, recalls Ellen Silbergeld, a professor at the University of Maryland Medical School, was one of the hallmarks of Rall's genius as NIEHS director:

> He fostered productive interactions between cutting-edge science and critical needs in the public policy of environmental health. By anticipating the next crisis in environmental policy, he prepared us all to meet it with reduced anxiety and acrimony; at the same time, he defined again and again the critical gaps in research and inspired a generation of scientists to get the interdisciplinary training to fill those gaps.

Rall again used these talents to develop the NIEHS Extramural Program to administer an expanding portfolio of PHS grants and

awards in environmental health science to researchers at colleges and universities throughout the United States. The establishment of the NIEHS Environmental Health Science Centers has promoted a multidisciplinary approach to the complicated problems of environmental health science and provides a mechanism for focusing academic resources on the search for solutions. According to William G. Thilly, director of the MIT Center for Environmental Health Sciences, Rall's progressive vision is illustrated by an instance when

> several university representatives were called together to discuss the directions that research sponsored by the Superfund Basic Research Program might take. . . . At the meeting a general strategy was put forward which might charitably be called "cautious" but was more reasonably described at the time as the "same old stuff." Somehow Rall and his extramural staff found a way to make sure that a generous portion of innovative proposals got funded while keeping peace in that part of the university community with more traditional approaches.

Although Rall is renowned for his role in the NIEHS's evolution from a small nucleus of people with large ideas to a preeminent center for environmental health science research, perhaps his most remarkable legacy is the development of the National Toxicology Program (NTP). The NTP, established in 1978, is a cooperative effort to coordinate toxicological testing programs within the Department of Health and Human Services. The major objectives of the NTP are to increase the depth of knowledge about the toxicology of chemicals, to evaluate the full range of toxic effects of chemicals, to develop and validate more effective assays for toxicity, and to disseminate toxicological information resulting from its studies.

In 1978, the NIEHS was designated as the focal point for the establishment of the NTP, and Rall was appointed as its director. Arthur Upton, former director of the NCI, characterizes Rall's work in the establishment and guidance of the NTP as his greatest achievement, and states, "The NTP, the only comprehensive toxicology testing program in the world, is extraordinarily important because it has created a body of toxicological data that is precious in terms of public health." The work of the NTP, says Devra Davis, a senior scientist with the World Resources Institute, set a course of research for animal testing that will extend into the 21st century.

Rall's role in the success of the NIEHS and the NTP as global leaders in both the pursuit of scientific knowledge of environmental agents and the application of this knowledge for the protection of human health institutions cannot be underestimated, says Bernard D. Goldstein, director of the Environmental and Occupational Health Sciences Institute at Rutgers University. "The NIEHS has not only been the central focus in the United States for basic scientific research of the highest quality," he says, "it has served as a template for other countries throughout the world."

Through the various activities of his career, Rall emerged as an international leader and representative of U.S. science worldwide. Rall served as the U.S. coordinator of cooperative environmental health programs between the United States and the U.S.S.R., the United Kingdom, Egypt, Japan, the People's Republic of China, Taiwan, Italy, Finland, and Spain. As a result of his work in attempting to strengthen international scientific cooperation, in 1975 the NIEHS was designated by the World Health Organization (WHO) as a Collaborating Center for Environmental Health Effects. In 1980, Rall played a leading role in an effort to establish the WHO's International Programme on Chemical Safety (IPCS), the goal of which is to provide an internationally evaluated scientific basis for the assessment of the risks to human health and the environment of chemicals. A decade later, Rall again articulated the need for such activities at a 1990 Conference on Environmental Health in the 21st Century:

> It is our job as scientists to attempt, as best we can, to look into the future, see the changes ahead, and anticipate the side effects of these changes. But we know from past experiences that there are few important and useful discoveries that do not have some unanticipated, undesirable side effects. It is our responsibility to alert leaders in public policy and suggest to them how we might prevent or minimize any negative health consequences.

Throughout the years, such firmly held beliefs guided Rall's estimable career, through which he has come to be regarded as one of the most outstanding and dedicated scientific leaders of his time. This opinion is evidenced by the many recognitions he received for his lifetime commitment to public service and scientific research, including the PHS's Distinguished Service Medal, which he received in 1975 and again in 1990 for sustained leadership in the development of the field of environmental health science. In 1979 he was accepted as a Member of the National Academy of Sciences' Institute of Medicine (IOM), whose membership consists of the preeminent physicians of the United States.

Just as Rall's contributions were not limited to national boundaries, neither was the recognition of these achievements. In 1988 the WHO presented Rall with the Health for All 2000 Medal. He was recognized in 1989 by the Institute of Occupational Health in Helsinki, which awarded to him its Distinguished Service Medal. Rall was also honored in 1989 by the Collegium Ramazzini, an international academic society that examines critical issues in occupational and environmental medicine with the goal of preventing disease and promoting health around the world. In the week following Rall's death, Philip Landrigan, president of the Collegium Ramazzini, announced the establishment by his organization of the David Rall Memorial Fund. Says Landrigan:

> David Rall was a giant in environmental health who never forgot his responsibilities to future generations and to colleagues in nations outside the United States. Over the years of his life, he helped to advance the careers of hundreds of young scientists in this country, and found ways to assist and encourage the good work of researchers and public health advocates in nations around the world. The fund established in his memory will continue his legacy by providing support for the work of environmental health scientists in all nations, focusing especially on assisting younger scientists and scientists in developing nations.

In 1990, Rall retired from the NIEHS but remained extremely active in the environmental health arena. Recently, he chaired the IPCS and held a variety of other positions including foreign secretary of the IOM, board member of the Environmental Defense Fund, chairman of the Scientific Advisory Council of the Hawaii Heptachlor Research and Education Foundation, and member of the Board of Scientific Counselors of the National Institute for Occupational Safety and Health.

Although the loss of Rall will continue to reverberate in the scientific community, his legacy will live on. Says Kenneth Olden, current director of the NIEHS and NTP, "The study of how the environment affects our health has lost a pioneer. Dr. Rall established the credibility of [the NIEHS and NTP] and set the pace. In our current research on human susceptibility to the environment and on alternative test methods, we are standing on his broad shoulders." This sentiment is echoed by others in characterizing Rall's contributions. Says Silbergeld, "His wisdom nurtured the careers of all of us, and set a standard of integrity and commitment that we can strive to emulate. The best memorial to his life will be the next generation of scientists that he sent forth to continue his work." For this, perhaps most of all, says Donald Frederickson, former director of the NIH, "[Rall] has earned a place in the pantheons, not only that of the NIH and all the academic institutions that comprise its universe, but among the scientists who have fought hard for the only planet we share."