

smallest dose is associated with some risk. Under these circumstances, the exposure of the population to any increase in radiation should not occur unless there is reason to expect some compensatory benefits.

3) Because of our present limited information, an accurate estimate of the hazard and the benefits of a specific level of radiation is not possible. Therefore, pending more precise information, we *recommend* that the population permissible dose for man-made radiation be based on the average natural background level.

Although it is not our responsibility to determine the exact level, we believe that the population permissible somatic dose from man-made radiations, excluding medical and dental sources, should not be larger than that due to natural background radiation, without a careful examination of the reasons for, and the expected benefits to society from a larger dose.

It is expected that, because of fluctuations in time and location, the population average dose will be considerably less than the maximum permissible dose.

4) For purposes of computation, it

should be permitted to average the amounts over a suitably long period of time, *e.g.* one year, and a reasonable sized population.

5) For radiation sources, such as radioactive strontium and iodine, which deliver radiation predominantly to one organ or tissue, the maximum permissible dose should be established for the tissue or organ that is expected to receive the most radiation.

6) It is not possible at present to monitor the population dose solely by measuring the dose to individuals. Furthermore, any effective control over radiation levels must be directed at the levels of radiation and radioactive materials in the environment. This means that maximum permissible levels will need to be established for such factors as food, water, and air. The levels should be set so that the typical person in the area will not receive more than the established permissible dose when all sources are combined.

7) It is recognized that setting environmental levels involves assumptions and conversion factors to translate these into human body levels. These factors may be expected to change with new information, so the environmental levels

may be expected to require continuous revision even though the maximum permissible limits to the body are not changed.

8) Recommendations regarding a maximum permissible level for medical and dental exposures to the patient are not given because for somatic effects of radiation the possible harm and prospective benefits occur in the same individual in contrast to radiation involving genetic material. The committee urges that continual caution be exercised to maintain radiation for medical and dental purposes at the lowest feasible level.

9) Finally, the committee wishes to emphasize that under one of the primary assumptions made in this report (nonthreshold linear dose response), the biological effect does not suddenly change from harmless to harmful if any permissible dose is exceeded. Any permissible level which may be chosen is essentially arbitrary and every effort should be made to keep the radiation dosage as far below the permissible level as feasible. On the assumption noted above, any radiation dose should be thought of as being tolerated only to obtain compensatory benefits.

Cornelius Packard Rhoads, Leader in Cancer Research

In announcing the death of Cornelius Packard Rhoads, which occurred on 13 August 1959, the Sloan-Kettering Institute described him as "one of the principal pioneers in the development of treatment of cancer by drugs." This was a modest statement indeed. He was, in fact, one of the chief architects of the modern era of cancer research. His attraction to this field was a natural one, from his early training in surgery and pathology and his later connection with the Rockefeller Institute for Medical Research. Two appointments that Rhoads received in 1940 were de-

cisive factors in the shaping of his career. At that time he became professor of pathology at the Cornell University Medical College and director of the Memorial Center for Cancer and Allied Diseases. In 1945 he was appointed director of the newly established Sloan-Kettering Institute for Cancer Research, a research affiliate of Memorial Center. Five years later he relinquished the directorship of Memorial Center to concentrate his energies on the research programs of the Sloan-Kettering Institute.

Rhoads' personal contribution to

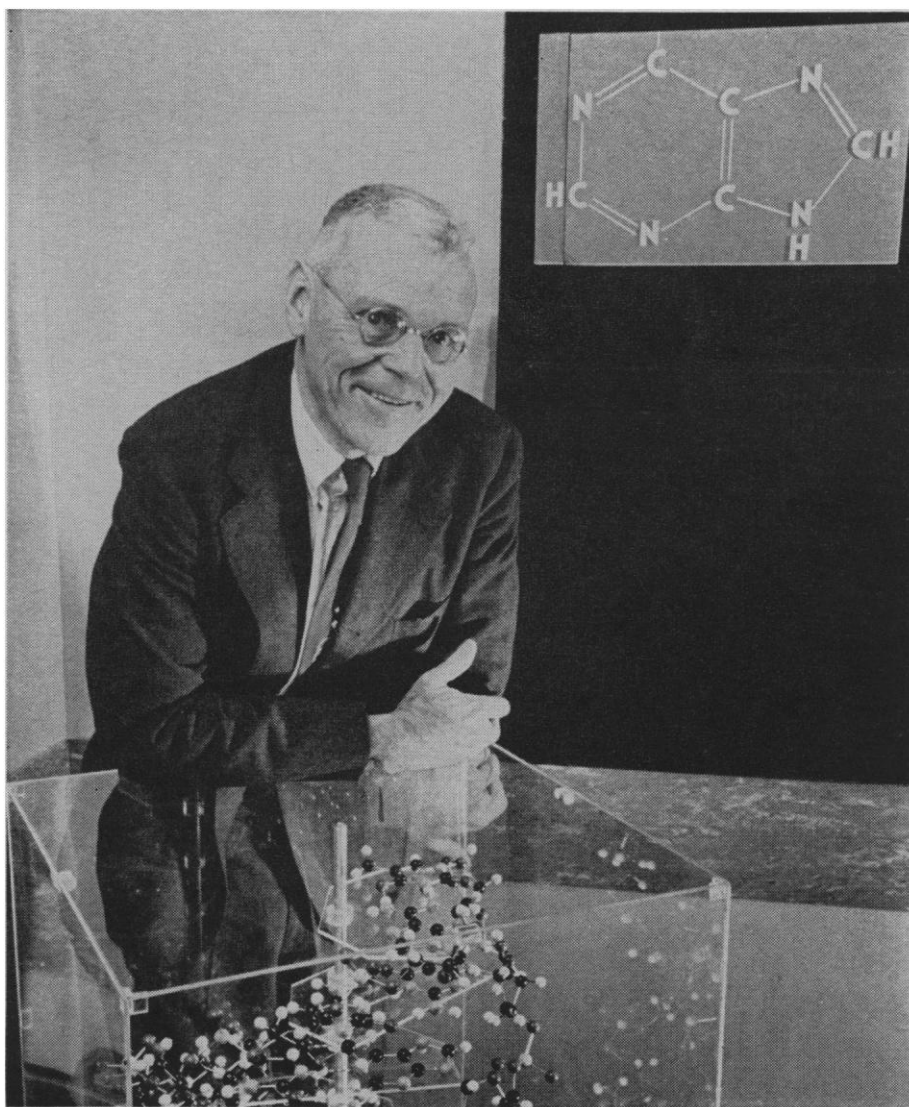
medicine and medical education, and particularly to cancer research, was a tremendous one. Until his death he continued in his appointment as professor of pathology in the department of biology and growth of the Sloan-Kettering Division of Cornell University Medical College. As a member of the National Research Council he served during World War II as a member of its subcommittee on blood substitutes, as a member of its committee on war gas casualties, and as chairman of its blood procurement service. Later he was a member of the Council's committee on veterans' medical problems and committee on atomic casualties. He was a member of the National Research Council's advisory committee on chemical-biological coordination and a member-at-large of its Division of Medical Sciences.

Rhoads served as chairman of the committee on growth of the National Research Council—a group which for several years provided valuable guidance and inspiration for the development of modern cancer research. He

was an early member of the National Advisory Cancer Council of the Public Health Service and later became a member of the Cancer Chemotherapy National Committee which was formed in 1955 to provide guidance for the national, cooperative, voluntary cancer chemotherapy program administered through the Cancer Chemotherapy National Service Center at the National Cancer Institute. He was a member and former director of the American Cancer Society and a member of the special committee on cancer control of the Medical Society of the County of New York. His honors and appointments, and his membership in professional and learned societies, were numerous and distinguished.

Although the extensive, provocative, and highly promising field of chemotherapy took a large share of Rhoads' attention, his interest was by no means confined to this aspect of the cancer problem. He was equally interested in and alert to the importance of such fields as steroid metabolism in cancer, clinical biochemistry of gastric and other forms of cancer, diet in experimental cancer, and anemia. In fact, there was no facet of the problem of neoplastic disease that fell outside the wide circumference of his professional interest.

The Sloan-Kettering Institute for Cancer Research became Rhoads' whole mission. In guiding its course he exhibited an unusual combination of administrative ability, scientific direction, and executive leadership. He had an instinct for finding "the right man for the job" and inspiring him with an enthusiasm for the work that produced remarkable results. He wanted his associates to have the best possible environment in which to live and work. He wanted them to feel encouraged and, above all, to succeed. In order to provide them with the best, he worked hard to develop sound research programs and then to seek support for these programs from whatever private and public resources he could reach. As the captain of a large and diversified research force he saw the large issues and exhibited impatience with trifles.



Cornelius Packard Rhoads

In short, his leadership was of the highest order.

Had Rhoads been allowed time to reflect upon his career before it was so suddenly ended, I can imagine that he might have summed it up with a thought like that expressed in the last words of a "namesake," Cecil Rhodes: "So little done—so much to do." Yet he could not deny, in all modesty, the magnitude of his own accomplishments and the importance of his guidance and counsel in shaping the modern era of cancer research. There is, in truth, much to do—so much, in fact, that the task is a staggering one to contemplate.

It will be done under the courageous and imaginative leadership of men like "Dusty" Rhoads. We will find them among those whose growth in stature is nourished by his example. For Cornelius Rhoads will emerge in the fullness of time as the dominant figure of an era of unprecedented importance in the centuries-old battle against one of the worst scourges of mankind. The ultimate victory will be no less his than ours.

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