M. H. Adams, Virologist and Biochemist

Mark Hancock Adams died on 17 October 1956 at the age of 44, at his home in Huntington, Long Island, of a ruptured spleen, a rare complication of a not uncommon and usually mild infectious disease, infectious mononucleosis.

Mark Adams was born on 21 April 1912 in Franklin, Pennsylvania. His mother died a few months later as a result of an infectious complication of her first childbirth. He grew up under the guidance of his father and grandfather, who were both ministers. He attended public school in Rutherford, New Jersey; high school in Baldwin, Long Island; and college in New York City at Columbia University. He took his graduate training in chemistry under J. M. Nelson at Columbia University and received his Ph.D. degree in 1936. Shortly before this event, he was married to a high-school classmate, Hazel Huber. A teacher and nature lover, like Mark, she brought into the marriage a close companionship and complete understanding of him as a person and as a scientist.

At the beginning of his scientific career, he was primarily interested in organic chemistry and enzymology. His first major investigative work, which was the subject of his Ph.D. thesis, was concerned with the enzyme tyrosinase. With characteristic thoroughness, before proceeding with the problem, he critically analyzed the standard methods for enzyme assay and found them lacking in accuracy and reproducibility. He traced the difficulty to an instability of the protein in dilute solutions and found that addition of a protein such as serum albumin protected the enzyme. This was his first work on surface denaturation, a subject which he was to take up again later with the bacterial viruses.

His first five postdoctoral years were spent as fellow and later as assistant at the hospital of the Rockefeller Institute. Again his interests were divided between organic chemistry and biochemistry. In collaboration with W. F. Goebel, he worked on sugar chemistry and then also continued with his work on tyrosinase. He was intrigued by the interaction of this enzyme with its antibody, and his studies were among the first to document thoroughly the finding that an antibody can combine with an enzyme, in fact, precipitate it without interfering with the enzymatic activity. During his stay at the Rockefeller Institute, he participated in a clinical study on the effect of tyrosinase on hypertension, an experience which left him with an attitude of healthy skepticism toward certain types of clinical research, which he transmitted to his students.

In 1942 he joined the staff of the department of microbiology at New York University under the chairmanship of C. M. MacLeod. During World War II he participated in the teaching of medical and dental students in an accelerated program and worked on an OSRD project on gas gangrene. He developed a simple medium for the production of the alpha toxin of *Clostridium welchii* and prepared a toxoid which was used on human volunteers.

After the war he turned to a new field of investigation—bacterial viruses. This branch of microbiology appealed to him because it had just become a quantitative science and, particularly, because it required a broad and thorough knowledge of biochemistry, genetics, physical chemistry, and statistics. It represented the greatest challenge to his inquiring mind. He took a course on bacteriophages which was given in Cold Spring Harbor at the Long Island Biological Laboratories. His unusual gifts were quickly recognized by Max Delbruck, who conducted the course, and at the end of the course it was proposed that he take over the teaching of the course in future years. He accepted, and for 7 years he taught a rapidly expanding course which attracted students of outstanding caliber, among them well-known physicists, biologists and biochemists.

Meanwhile he had started on his own research on bacterial viruses, and, characteristically, his first study led him to investigate certain variabilities in the assay procedure. He rediscovered with the viruses the phenomenon of surface inactivation which he had investigated with tyrosinase. His published paper on this work is a characteristic example of his thorough and critical approach which eliminated a great deal of confusion regarding the concept of "protective colloids." In logical sequence followed several other studies on the stability of bacterial viruses, such as heat inactivation and the effect of metals. In the course of these studies, a marked stimulatory effect of calcium on the *Escherichia coli* phage T_5 production was discovered and was made the subject of a special study. A mutant of T_5 which exhibited increased resistance to heat denaturation was isolated and led to an investigation of simultaneous growth of related phages in a single cell and of exchange of genetic properties. These experiments stimulated Mark Adams to meditation regarding phylogenetic relationships between viruses and the evolution of new viral types. Experiments on hybridization between the *coli* phage T_5 and the *Salmonella* phage PB were then pursued. By now he was deeply involved in problems of the classification of viruses and wrote several papers which contain thorough and critical analyses of criteria for the classification of bacterial viruses.

About 5 years after he had entered this new field, he was considered one of the leaders in the bacteriophage field, and, as an inevitable result, was frequently asked to write review articles and to participate in symposia. Some outstanding contributions were the results of these efforts. One of them, entitled "Methods of study of bacterial viruses," is a classic to which most workers in the field continuously give reference. Another, on the role of polysaccharides in virus reproduction, is a model review with respect to lucidity and critical analysis. A detailed and brilliantly written monograph on bacterial viruses, almost completed at the time of Mark Adams' death, will be published posthumously.

These many writing activities did not prevent Mark Adams from starting a new line of inquiry in his research. He approached the problem of the various stages of virus-host cell interaction. Investigation of the kinetics of absorption at various temperatures, observations on "abortive" infections at low temperatures, frequency distributions of phage release in one-step growth experiments, and finally the description of an enzyme, a polysaccharide depolymerase which is liberated by infected bacteria, are among the latest contributions from the laboratory of Mark Adams.

As a teacher he was outstanding. Students who may have feared him at the beginning of a course were his admirers at the end. William Osler once said that a university has a dual function: to teach and to think. Mark Adams taught and thought and taught others to think. His devotion to teaching was so apparent and his pleasure in helping others so obvious that no one hesitated to seek his

advice, although knowing that the problem would probably be dissected in such a manner that perhaps nothing would be left of it. In his lectures, Mark Adams exhibited an unusual gift for developing a scientific theme and for bringing continuity and clarity to a subject of the most complex structure. Above all, his enthusiasm for the critical analysis of the scientific problem, which he tried in vain to restrain, was transmitted to the audience, and he could carry his listeners along through foreign territories. If there was evidence that was inadequate, or if there was a flaw in the reasoning, or if there was perhaps a little wishful thinking, it would never escape his notice.

It was not surprising that these particular talents should be called upon by an invitation to join the Editorial Board of *Science* in 1953. Among his many editorial contributions, his book reviews were outstanding. They embraced subject matter as far apart as chemistry, enzymology, infectious diseases, and Roman history. They all bear the mark of his incisive thinking and his uncompromising attitude toward loose talk. This uncompromising attitude was the same whether he was confronted by a book or by experimental data of his friends and students or his own. Perhaps sometimes his criticism was ill received by some who did not grasp the spirit in which it was given. Having shared a laboratory with Mark Adams for 8 years, I may perhaps qualify as a key witness in testimony of his critical abilities which spared no time or effort to unveil the precise and relevant facts. That it did not mar the relationship to his friends and students was merely due to the fact that he did not successfully hide from them his gentle kindness, warm affection, and selfless interest in their mental and personal development.

Those who knew Mark Adams only as a quiet and rather shy person, or those who knew him only as a sharp critic, may have been surprised to see him perform as master of ceremonies at a Christmas party or at the yearly farewell party at the end of the phage course. His imagination, powers of observation, and sense of humor came to the surface at these occasions and filled many joyful evenings.

Mark Adams had several avocations. They were pursued with the same thoroughness and perfectionism as his scientific endeavors. Together with his wife, he studied ornithology and archeology, he was interested in photography and enjoyed sailing. During one summer in Woods Hole he became interested in oil painting. He began by watching a friend paint for several days. After absorbing all the essentials of the procedure, he set out on his own. His second effort, a portrait of a fellow-scientist, was so accomplished and so original that even the model appreciated the painting and was anxious to acquire it.

In Mark Adams we have lost one of our most critical and courageous minds. We miss a brilliant teacher who was capable of transmitting the vibrations of his own enthusiasm. An investigator has left us who did not care how far the road he was building would stretch; who was more concerned that the road could be used by others too. And many of us have lost a teacher and friend whose unostentatious gentleness and warmth will remain in our memory, together with the image of a man utterly and uncompromisingly devoted to scientific truth.

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News of Science

Westinghouse Talent Search

High-school science students from 41 states and the District of Columbia have been selected as winners of 260 honorable mention awards in the 16th annual Science Talent Search. The 205 boys and 55 girls were chosen from a total of 3122 graduating seniors who represented schools in all 48 states and Washington, D.C.

Like the 40 winners named earlier who are competing this month for the Westinghouse science scholarships, all of those who receive honorable mention will be recommended to colleges and universities for scholarships. Selection of the 40 winners and 260 honorable mentions was based on the students' scholastic records and teacher recommendations, their science projects, and their standing in a science aptitude examination.

First place among states producing honorable mention winners this year is again New York with 58, 40 boys and 18 girls. California and Illinois rank second with 19, 18 boys and one girl in the former and all boys in the latter. Third place goes to Pennsylvania with 16 winners, 13 boys and three girls. Ohio's 12 winners, ten boys and two girls, give that state fourth place. Massachusetts is fifth with 11 honorable mentions, seven boys and four girls.

All of the honorable mention recipients have excellent scholastic records, and the judges have reported that they rank close behind the 40 winners who will compete for top national honors in Washington, 7–11 Mar., during the annual Science Talent Institute. One hundred four of them—77 boys and 27 girls—rank first, second, or third in their classes.

Fifty-seven of the boys and four of the girls selected for honorable mention have named physics as their first choice for future careers. Fifty boys and one girl hope to find careers as engineers, and 39 in the group favor some branch of chemistry. A total of 34, including 11 girls, prefer medicine. Nine girls hope to be teachers. One boy chose the ministry and one girl the writing profession.

The Science Talent Search is conducted by Science Clubs of America through Science Service. The Westinghouse Educational Foundation, supported by the Westinghouse Electric Corporation, provides the awards and makes the Science Talent Search financially possible.

Army's Solar Furnace

The Department of the Army has announced that a large solar furnace capable of concentrating the sun's rays to produce temperatures comparable to those generated by an atomic explosion will be erected at the Quartermaster Research and Engineering Center, Natick, Mass. The furnace will have an energy equivalent of approximately 28 kilowatts.

The facility will be utilized for laboratory testing of materials intended for the protection of military personnel against the thermal effects of nuclear and other weapons. Standard sources of intense heat, such as high-current electric arcs,