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FREDERICK C. ROBBINS
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A Biographical Memoir by

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FREDERICK C. ROBBINS

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BY ADEL MAHMOUD

FREDERICK C. ROBBINS WAS a major force in the fields of infectious diseases, pediatrics, and public health. Early in his career he established a prominent position in the science of medicine, having won the Nobel Prize in Physiology or Medicine in 1954 for work performed in the laboratory of his mentor and co-Nobel Laureate, John Enders. The two of them were joined by Tom Weller in receiving this remarkable honor. Fred Robbins's talent and leadership were demonstrable all through the subsequent 50 years as a physician, investigator, educator, and a statesman of science.

The seminal observation for which Enders, Weller, and Robbins were awarded the Nobel Prize stems from their discovery of how to grow poliomyelitis virus in human cell cultures. This finding led to the development of the two most effective poliomyelitis vaccines and their use in eliminating paralytic polio in many parts of the world. During his scientific career, Fred Robbins was gratified to witness the impact of this seminal discovery on the lives of billions; it was unfortunate that he was unable to see this eradication come to a successful conclusion during his lifetime.

I had the honor and good fortune to be mentored by

Fred for over 30 years and to watch him as a professor, dean, and national and international leader. While he was dean and professor at the Case Western Reserve University School of Medicine, he presided over the shaping of the careers of several graduating medical classes and continued his spiritual and role model guidance of these generations of physicians for many years thereafter. As president of the Institute of Medicine he brought the public health as well as the scientific basis of medicine to the forefront of the national and international agenda. Upon returning to Case Western Reserve University, Fred once again was in his best element: leading, being a statesman of science and education, and guiding his colleagues and institutions. Fred was a warm, gentle, caring, and inspiring mentor to the thousands he touched during his remarkable career. For many years he watched and participated in the interplay of the Cleveland medical institutions. He never interfered, but rather encouraged mutual respect and the necessity for collaboration.

EDUCATION AND EARLY LIFE

Frederick C. Robbins was born in Auburn, Alabama, on August 25, 1916. His father was a professor of botany; his mother also was a botanist. The family soon moved to Columbia, Missouri, where he shared the early years with his two brothers. In September 1928 as Fred was turning 12, his father accepted a two-year appointment in Paris. The Robbins family did not think that schooling in Paris was desirable for the boys; so his mother admitted him to a public school in Switzerland. The following year Fred was enrolled in a boarding school, Institut Sellig, located on the shores of Lake Geneva. Fred seems to have enjoyed Switzerland and had a good time exploring the mountains around Lake Geneva and skiing during winter. Although

Fred was not fluent in French, he managed many subjects being taught in French, including mathematics. Reflecting on his experience in Switzerland, Fred said that in Switzerland he learned in two years the equivalent of four years in an American school. This was clearly evident as he returned to Columbia, Missouri. Fred was expected to enter ninth grade, but the principal placed him in the eleventh grade because of all the courses he took in Switzerland.

Upon graduation from high school Fred Robbins enrolled in the Arts and Science College of the University of Missouri in 1932. He was on the Honor Rank List of the university in the subsequent three years, graduating with an A.B. degree in 1936. During his college years he changed his plans for a career in chemical engineering to one in medicine. While at college, Fred lived at home but maintained the habit of taking his noon meals and Sunday dinners at his fraternity house. The college years were important for Fred's academic achievements and equally for sports and membership in the university Reserve Officer Training Corps. Fred's favorite sport was polo; he enjoyed the practice and competition. As a member of the ROTC he demonstrated excellence in the basic elements of the military and was admitted to the Tiger and Crack Battery. In 1936 Cadet Major Frederick C. Robbins was awarded a medal of the Sons of the Revolution for his ROTC activities. The medal was for the "highest rating in leadership, soldierly bearing, and excellence."

Following college, Fred enrolled in the two-year medical school of the University of Missouri and graduated with a bachelor of science degree in medicine in 1938. He transferred to Harvard Medical School; at that time Harvard admitted only one Missouri student to each class. Fred earned the M.D. degree from Harvard Medical School in 1940.

THE BEGINNING OF A SCIENTIFIC CAREER

Robbins began his postgraduate career as a resident physician in bacteriology at the Children's Hospital Medical Center in Boston, Massachusetts. He left that position in 1942 for military service and was assigned to the Fifteenth Medical General Laboratory as chief of the Viral and Rickettsial Disease Section. His military service years were spent in Italy and North Africa. While serving in the military, Fred focused his attention on the major infectious diseases of relevance to the services at that time. These included infectious hepatitis, typhus, and Q fever. In a series of carefully studied cases of Q fever Robbins and his colleagues published their findings in the *American Journal of Hygiene* in 1946, detailing the clinical features of the disease, its epidemiology, etiological agent, and the findings during a laboratory outbreak of Q fever. This was followed by examining the impact of vaccination against the disease.

Fred's early encounter with infectious diseases dominated his scientific pursuits for years to come. It reflected his commitment to meticulous science, the value of sharp clinical observations and mechanistic rather than descriptive exploration of scientific phenomena. It also allowed him to focus on infectious diseases within the total conceptual framework of public health and its imperatives.

Fred was awarded the Army's Bronze Star for Distinguished Service; he was discharged in 1946 with the rank of major. He returned to the Children's Hospital Medical Center to complete his training as an assistant resident. Robbins was then accepted for a three-year research fellowship that was supposed to be divided into a year with Dr. John Enders, a year in Australia, and the final year in New York. But the polio work in Enders's laboratory was fascinating, and Fred ended up staying there for the entire three-year fellowship.

THE SCIENTIST

The years in John Enders's laboratory mark the most significant inflection of Fred Robbins's career. In 1947 Dr. John Enders accepted the invitation to establish a laboratory for research on infectious diseases at the Children's Hospital in Boston. He moved to four rooms on the second floor of the Carnegie building and began recruiting assistants. Enders wanted to hire people he knew. The first person was his secretary, and then he hired Alice Northrop (soon to marry Fred Robbins) in September 1947, because he knew her from the Bacteriology Department at Harvard Medical School. Dr. Thomas Weller was there from the beginning to help Dr. Enders set up the lab. Fred Robbins arrived in January 1948. At that point Drs. Enders and Weller were exploring how to grow viruses in cultures of human cells. Enders suggested they study a familiar virus, such as mumps. Weller succeeded in propagating the mumps virus in vitro for the first time; they later developed serologic assays to quantify viral replication.

During the spring of 1948, two observations on poliomyelitis virus were obtained in Enders's laboratory. Weller inoculated a few unused human embryonic skin and muscle cultures with poliovirus. When he inoculated mice with the three-week supernatant from these cultures, all animals demonstrated paralysis. Enders suggested that Robbins use cultures of intestinal tissue similarly. Supernatant of polio-inoculated intestinal tissue cultures induced paralysis equally in mice.

Enders's laboratory shifted its major focus thereafter to poliomyelitis. The laboratory focused on culturing other virus types, examining changes in infected cells, and developing in vitro assays. By 1949 Robbins used the cell culture system to isolate poliovirus from individuals infected with

the virus. These observations resulted in the first publication that Enders, Weller, and Robbins communicated to *Science* in 1949. Robbins stayed in Enders's laboratory for a few more years. He continued working on tissue culture methodology to isolate polio and nonpolio enteroviruses from clinical materials. He also devoted a significant effort to studying the growth characteristics and pathological consequence of poliovirus in cultures.

The years Fred Robbins spent in Enders's laboratory were unique scientifically and socially. At the beginning Fred was not assigned a desk or a technician, and he used to confine his mild displeasure quietly to Alice. They finally gave him a desk and then a technician. The laboratory atmosphere was congenial and relaxed. Dr. Enders and the group always ate lunch together and the conversation would cover all sorts of subjects. The Enders lab was a unique, small, and intimate group of five people. They worked hard.

During the early months of 1948, Fred Robbins asked Alice to go to the movies or out for dinner on several occasions; they were engaged in May of the same year. Alice suggests that the speed of their friendship and enjoyment was a result of seeing each other every day. Fred was a very pleasant, easygoing, and relaxed guy. Alice reflects, "Fred always appeared very relaxed. Maybe he was not as relaxed as he seemed, but he just went along with whatever the three of them (Enders, Weller, and Robbins) decided to do." Fred and Alice were married on June 19, 1948, merely six months following Fred's joining the Enders laboratory. The wedding took place in Princeton, New Jersey, where Alice's family lived and where Alice grew up. The whole family enjoyed the wedding party on the lawn, which overlooked Lake Carnegie in Princeton. Following their wedding, Alice had to leave the Enders laboratory, since it was known that Dr. Enders did not want married couples in his

laboratory. Alice joined the Department of Nutrition and continued working with experimental animals. The Robbins family maintained close relationship with Dr. Enders for many years. They gave their second daughter the middle name of "Enders."

THE NOBEL PRIZE

Here are Fred's words describing how he got the news:

> In 1953, we heard a rumor that our group had been nominated for the Nobel Prize. We did not take it too seriously and nothing happened. In October 1954, however, I received a call from Western Union, and they read me a telegram from Stockholm, Sweden, stating that Enders, Weller, and Robbins had been selected as recipients of the Nobel Prize in Physiology or Medicine. Western Union said that they would send me the telegram, but it never arrived and I have often wondered who, if anyone, has that piece of paper. Needless to say, the news was a shock but a pleasant one.

Alice was not home when Fred received the call. Upon her return the couple had to get organized quickly getting passports, buying clothes, and preparing his talk. The Robbins and Enders families traveled on the *Queen Elizabeth* to England and through the North Sea to Sweden. During the last leg of the trip, big storms and big waves made for a rough journey, which exhausted the travelers. The festivities in Stockholm, however, were rewarding to everybody.

THE FIRST CLEVELAND PERIOD: PROFESSOR THEN DEAN

Cleveland medical institutions recruited Fred Robbins and his colleague Bill Wallace in 1952. Fred became a professor and the head of pediatrics at City Hospital; Bill became a professor and the head of pediatrics at Children's Hospital, which is a part of University Hospitals of Cleveland. The arrangement then was that the leader of pediatrics at Children's also became the chair of the department

at the Medical School. Fred was not happy with such arrangements, but since Bill Wallace was a good friend, the two worked well together. It is interesting to note that this arrangement has remained a cause of friction for the different Cleveland medical institutions to this day.

City Hospital at the time Fred joined its faculty was a major academic institution in Cleveland, with such distinguished academic figures as Charles Rammelkamp, Edward Mortimer, Fiorindo Simeone, and many others. A remarkable number of fellows and junior faculty trained under the guidance of Fred and his colleagues at Cleveland. His leadership supported the growth of the pediatric faculty in performing basic as well as clinical research. The hospital pioneered the first child life program in the country. It was Fred's personality and vision that created a nurturing atmosphere that motivated faculty, fellows, and residents to embark on careers in patient care and medical sciences. These were the great days of City Hospital, a part of the legends of the institution's history.

In 1966 Fred Robbins accepted the position of dean of the Medical School at what is now known as Case Western Reserve University. He immediately established a new way to lead multiple institutions that spent a lot of energy on controversies. His stature, personality, and vision guided the school at a difficult time of transition. The institution was at the tail end of the Joe Wearn era, which was epitomized by a generation of department chairs who developed a new curriculum and a nationally distinguished reputation. For several years Fred maintained the momentum, but by the mid-1970s it was clear that new blood and new leadership was acutely needed. He initiated a cycle that brought new chairs of medicine, surgery, family medicine, molecular biology, biochemistry, and pharmacology. They constituted the next wave of chairs that led the institutional

revival and brought a new surge of energy, scientific excellence, educational commitment, and clinical acumen.

In the meantime, Fred's national and international reputation as a statesman of medical sciences was growing. His interest in polio was maintained all through his career. He chaired the Pan American Health Organization commission that was overseeing polio eradication in the continent. He was a happy person when the commission certified that polio had been eradicated in the Americas. It is unfortunate that the global polio eradication program is facing significant recent challenges in Africa and Asia. Fred would have liked to have been with us when the final curtain came down on poliomyelitis.

INSTITUTE OF MEDICINE: PRESIDENT

In 1980 following retirement from Case Western Reserve University at age 65, Dr. Robbins decided to accept the presidency of the Institute of Medicine, a part of the National Academies. His influence on the national and international scientific issues had been expanding. Fred had been a member of the institute, and he liked the organization and its people. While Fred was excited about the move to Washington, Alice was not. She was going to leave a much settled pattern of life in Cleveland, lots of friends, and lots of activities. But the two of them finally managed to enjoy the scientific and social scene in Washington. Fred's presidency was a period of reflection and positioning of the organization. His role also involved chairing of the Commission on Life Sciences of the National Research Council. He served as a member of the Executive Board of the Office of International Affairs of the National Academy of Sciences. He was involved in several other academy activities and participated actively in the functions of several of its boards. Fred testified before congressional committees and commanded

the respect of the administration as well as legislative branches of the U.S. government. Fred's tenure at the Institute of Medicine was also marked by an appreciable increase in the organization's involvement in global health issues as well as an enhanced understanding of the disparities in health care in America.

THE RETURN TO CLEVELAND

Once Fred's tenure at the Institute of Medicine came to its end, he and Alice headed back home to Cleveland. The medical scene had been changing rapidly, but the place of the Robbinses in the hearts and minds of their colleagues and the community at large was well preserved. Fred elected to become emeritus professor in epidemiology despite my invitation to have him join the Department of Medicine. His vision, which he never shared with me openly, must have been to stay away from clinical departments that were involved in all sorts of competition among the multiple Cleveland medical institutions.

The "neutral" base he chose in epidemiology marked the beginning of another most productive and influential phase in his career. During the ensuing two decades, he initiated a university-wide center for international health, a center for adolescent health, and guided several exciting research areas. But perhaps the one with the most impact was his championing of the development of a scientific collaborative effort on HIV/AIDS between several institutions in Uganda and Case Western Reserve University. His visits to Uganda and meetings with the president of that country marked the beginning of a sustained and productive interaction. The unit that Fred initiated in 1985 is still a thriving research enterprise in Uganda and has resulted in the involvement of many U.S. academic institutions and several

international organizations—a remarkable set of achievements in controlling HIV in that country.

PROFESSIONAL MEMBERSHIPS AND OTHER ACTIVITIES AND AWARDS

Fred Robbins was elected to many societies both in the United States and globally. He was a member of the American Academy of Arts and Sciences, American Philosophical Society, American Society for Clinical Investigations, Association of American Physicians (honorary member), and Infectious Diseases Society of America. Dr. Robbins was a member of the National Academy of Sciences as well as the Institute of Medicine. He served as president of Society for Pediatric Research; president, American Pediatric Society; chair, Technology Assessment Advisory Council, Office of Technology Assessment, Congress of the United States; chair, NASA Life Sciences Strategic Planning Study Committee; and chair, International Commission for the Certification of Poliomyelitis Eradication, Pan American Health Organization.

During his prominent service at national and international levels, Dr. Robbins consulted and advised multiple institutions, including the U.S. Public Health Service, U.S. Armed Forces Epidemiological Board, National Institutes of Health, Pan American Health Organization, Food and Drug Administration, NASA, and the World Health Organization.

Fred Robbins was honored by many national and international organizations, including the First Mead Johnson Award; Kimble Methodology Research Award; Abraham Flexner Award of the Association of American Medical Colleges; NASA Public Service Award; and the Benjamin Franklin Medal of the American Philosophical Society. He received honorary degrees from John Carroll University, the University of Missouri, University of New Mexico, University of North Carolina, Tufts University, Medical College of Ohio,

Albert Einstein College of Medicine, Medical College of Wisconsin, Medical College of Pennsylvania, and Case Western Reserve University.

MENTOR AND FRIEND

I was introduced to Fred Robbins early in 1973 upon my arrival in Cleveland to begin postdoctoral training at Case Western Reserve University. He was the dean, Nobel Laureate, and scientific giant. In spite of the halo he demonstrated kindness and a light touch that made everyone around him at ease. He used to walk the corridors of the medical school, hospital, and research building and casually drop by just to keep in touch. Since my training was funded by a grant from the dean's office, I was convinced that he was making sure the funds were put to a task of his liking. As I gradually got acquainted with him, his skills and dedication to mentoring of students and faculty became obvious. Over the years his mentorship gradually matured into a special friendship of no equal. He exuded warmth and good sense and graciously provided advice. We stayed in touch while he served as president of the Institute of Medicine. His return to Case Western Reserve reflected the deep bond he had with that institution and its faculty and students. He instantly became the celebrated statesman he always was, but with a broad vision and remarkable appreciation of the new challenges facing academic medicine. He is deeply missed.

I WOULD LIKE TO ACKNOWLEDGE and express my appreciation and gratitude to Alice Robbins. She devoted a considerable amount of time, shared documents, and helped portray the life and achievements of Fred Robbins.

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