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WILLIAM JACOB ROBBINS

1890—1978

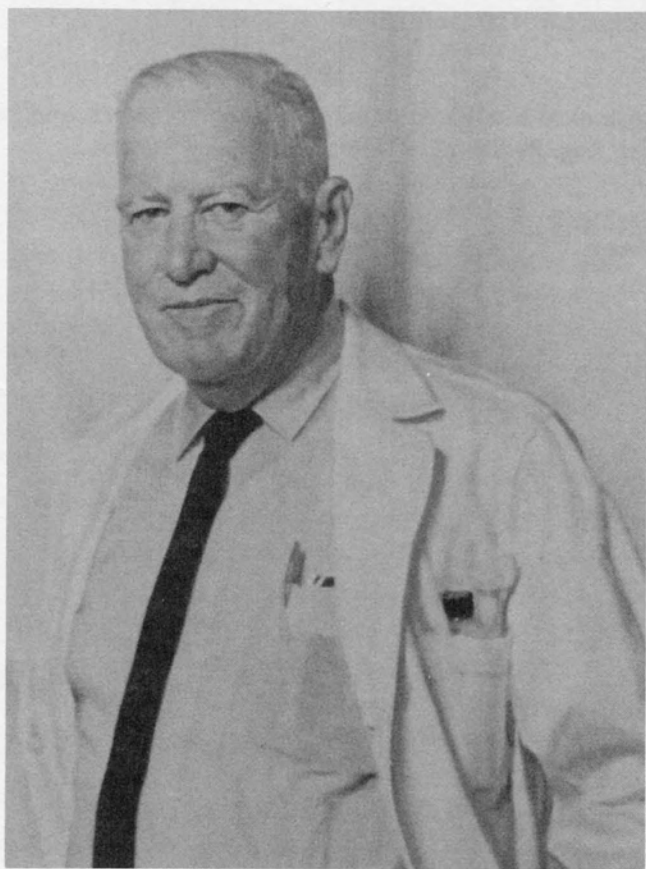
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*A Biographical Memoir by*  
FREDERICK KAVANAGH AND ANNETTE HERVEY

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*Biographical Memoir*

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*William H. Hobbes*

# WILLIAM JACOB ROBBINS

*February 22, 1890–October 5, 1978*

BY FREDERICK KAVANAGH  
AND ANNETTE HERVEY<sup>1</sup>

**D**R. WILLIAM JACOB ROBBINS lived several lives: botanist, teacher, administrator, educator, valued advisor, and avid fisherman.<sup>2</sup> A scientist most of his life, he earned his living as a teacher for twenty-eight years and an administrator for nearly fifty. Yet Robbins kept his separate lives apart so successfully, few who knew him in one role knew of his accomplishments and problems in the others.

A robust man about five-feet-eight inches tall and weighing 175 pounds in his prime, Robbins rarely missed a day of work. During the years he was director of the Garden he lived in a large house in Bronxville and—until he was seventy-three—maintained garden and grounds himself. A man of prodigious energy, he often slept only a few hours a night and in 1949 complained “that he was no longer capable of working more than fourteen to sixteen hours a day without some diversion.”<sup>3</sup>

Since Robbins worked discreetly behind the scenes, his

<sup>1</sup> A longer version of this essay appeared in the *Bulletin of the Torrey Botanical Club* 108(Jan.–March 1981):95–121.

<sup>2</sup> David R. Goddard, past president of the National Academy of Sciences, wrote: “It is my evaluation that Dr. Robbins played a larger part in the NRC and NAS than any other botanist in the last several decades,” in letter to the editor of the *Biographical Memoirs* dated March 10, 1982.

<sup>3</sup> [Mrs. Henry] Steeger, “Our Director,” *Garden* 2(September 1949).

influence was much greater than the public record indicates. His extensive correspondence shows he was often consulted on matters of American science and that his judgment of people was consistently sound. An old-fashioned man, he believed that position and power carried with them responsibilities and that people and organizations should live within their means. He believed in hard work, perseverance, and honesty—and that promises and confidences should be kept.

#### EDUCATION AND EARLY LIFE

Frederick Robbins, William's father, grew up on a farm near Northumberland, Pennsylvania, where Robbinses had lived since 1794. When his son William Jacob was born, Frederick was principal of the high school in North Platte, Nebraska. A year later he took a job as principal of a school in South Williamsport, and the family returned to Pennsylvania. For the next twenty-seven years Frederick Robbins served as high school principal, then Superintendent of Schools, in different Pennsylvania towns, keeping up all the while the skill he had developed in his youth as a cabinet maker.

William remembered his father as a quiet but forceful man whom he revered for his scholarship and rectitude. Another influential man in his life was his Uncle Clint, with whom he spent many summers on the farm as a boy.

Clara Jeanette (Federhof) Robbins, William's mother, was a highly intelligent and gregarious professional journalist. A lifelong Democrat, she remained active in politics all her life. Her son was devoted to her and took care of her and her affairs in her later years.

From 1906 to 1910, William attended Lehigh University in Bethlehem, Pennsylvania. While there he spent a summer on the river taking water samples to be tested for bacterial contamination and found it a marvelous way to make a living.

This experience, coupled with summers spent working on his grandmother's farm, got him interested in biology and impelled him to go on to Cornell University, where he expected to become a plant pathologist on the way to becoming a scientific farmer.

When he got to Cornell in 1911, however, he found that Professor H. H. Whetzel could not accept him in plant pathology for lack of space. Instead, Dr. Lewis Knudsen took him in plant physiology. It was at Cornell that he met both Dr. B. M. Duggar and Liberty Hyde Bailey—both had beneficial influences on his life. Robbins spent the summers of 1912, 1913, and 1914 as Duggar's assistant at the Marine Biological Laboratory in Woods Hole. They apparently got along beautifully, for Duggar was later instrumental in getting Robbins posts at the Alabama Experiment Station and the University of Missouri, and it was he and Bailey who later persuaded Robbins to accept the directorship of the New York Botanical Garden.

Robbins's own education was unusual for a botanist in that he studied—in addition to Greek, physics, and botany—zoology, Latin, and mathematics during his four years at Lehigh University. On the subject of education, he had decided ideas:

"I am, as you know, a plant physiologist," he wrote Harry Kelley in 1960. "My first course was given by a zoologist who gave me a textbook by Genung and a place in which to work. I had no lectures, no instruction and no fellow students. What I did, I did myself and little as it was I think it had much to do with making me a plant physiologist, at least of a sort.

"I never learned that I could think for myself until I was a junior in college. I was a good student and studied the assignments given to me. There was considerable satisfaction in the process, as my teachers were likeable and just and the answers were always in the book or, if not, the teacher had them.

"In my junior year, I was given by the professor of psychology (and education) a major theme to prepare which differed from the usual type

since it required an answer to a question; the question, what is art? I discovered to my surprise, and somewhat to my horror, that there was no agreement in the books I read as to what art is. I was forced to make up my own mind, and in the process I learned that I could think, that I could consider a variety of different answers to a question and decide for myself what I believed to be correct. For the first time I was not looking for an answer which was given in the back of the book or in paragraph 6 on page 25 in footnote 5, Chapter 3, or in the pronouncement of one of my revered teachers. I was on my own, using the brains I had by a procedure which had been drilled into me by a long and thorough grounding in mathematics, namely—analyze and define the problem and then seek for its solution.

“I am inclined to believe that there are too many scholarships and fellowships and too few assistantships. I should like to see more use made of assistantships in the small institutions, as this in my opinion would encourage more boys and girls to follow a science career. This leads to my last point, and that is the importance of encouraging women to enter science. There are not enough opportunities and not enough encouragement and rewards for good women scientists.

“All of this is intended to emphasize the benefits to be derived from active participation. There are lectures and lecturers who perform a most useful function in arousing interest and stimulating an individual to pursue a subject. Such lecturers are not common. Nothing in my opinion takes the place of the ‘do it yourself’ approach.”<sup>4</sup>

### *Christine Chapman Robbins and the Robbins Family*

On July 15, 1915, shortly after receiving his Ph.D. from Cornell, Robbins married Christine Faye (Chapman) Robbins, who soon became the most important person in his life. Herself a trained botanist, Christine Robbins was also a gracious hostess and a scholarly scientific biographer. Robbins had complete confidence in her intelligent understanding, and their discussions contributed significantly to his success.

Born November 24, 1889, in Palmer, Massachusetts, Christine Chapman was the second daughter of Harvey

<sup>4</sup> W. J. Robbins, in a personal letter to Dr. Harry Kelley of the National Science Foundation, January 26, 1960.

Chapman (1860–1926) and Lydia Caroline Sharpe (1861–1913). John Chapman, the American primitive naturalist known as “Johnny Appleseed,” was related to her father through a collateral line. She graduated from Wellesley College and, encouraged by Margaret C. Ferguson, head of Wellesley’s Botany Department, entered a Ph.D. program in botany at Cornell. Upon obtaining her M.A. degree, she returned to Wellesley to teach for two years. Then, much to Dr. Ferguson’s disappointment, Christine abandoned further education in botany to marry William Robbins.

William and Christine Robbins were true American intellectuals. Superb, careful, and critical workers, both were Phi Beta Kappa as undergraduates, and their common interests in plants, nature, and science continued to bind them—along with family matters, gardening, current affairs, fishing, cooking, and travel—for the rest of their lives. Mrs. Robbins was also an active member of the League of Women Voters for many years.

A member of the Colonial Dames of America, Mrs. Robbins could trace her American ancestry back to the 17th century, while the earliest known American of her husband’s line was Daniel Robbins (1765–1864), of New Jersey. In her later years, Christine Robbins became a meticulous genealogical scholar. In addition to preparing comprehensive genealogies of the Robbins and Chapman lines, she wrote book-length biographies of David Hosack (C. Robbins, 1960) and John Torrey (C. Robbins, 1968). As a gift to each son, she and her husband drew up a comprehensive “family bible” that included charts, photographs, and biographies. Christine Robbins died of heart disease February 9, 1974, in New York City.

The oldest Robbins son, Frederick, entered the Army Medical Corps during World War II after two years at the University of Missouri Medical School. He completed his medical studies at Harvard, and—with John E. Enders—suc-

ceeded in growing poliomyelitis virus in tissue culture. In 1954, Enders, Robbins, and Thomas Weller received the Nobel Prize in Physiology or Medicine. Frederick became professor of pediatrics and later dean of Case Western Reserve University Medical School. In 1980 he went to Washington, D.C., to become president of the Institute of Medicine. He was elected to the National Academy of Sciences in 1972.

William Clinton Robbins graduated from Cornell Medical School and served in the Navy. He became an internist in private practice in New York City and clinical associate professor of medicine and associate attending physician at the New York Hospital-Cornell Medical Center.

Daniel Robbins attended Columbia University and also served in the Navy. After earning an M.S. in engineering he went on to become vice president of engineering for the Itek Corporation's Graphic Equipment Division in Rochester, New York.

#### THE INTERIM YEARS: 1916-1919

In February 1916 the Robbins family moved to Alabama, where William had accepted a post as professor and chairman of the Botany Department and plant physiologist for the Agricultural Experiment Station. Arriving in Auburn with very little money, they rented a house for \$25 a month. The cash book Mrs. Robbins kept from February to August, when Frederick was born, makes interesting reading. But if the position at Auburn offered only a small increase in salary (it paid \$2,000 a year), it offered the more important opportunity for Robbins to make his own, independent decisions.

A year later, however, Mrs. Robbins's father fell ill, and the couple moved to Springfield, Massachusetts, to be near him. From August 1917 to July 1918, Robbins managed Chapman & Brooks, the family's wholesale hardware business, discovering through a mathematical analysis of the busi-



ness that a trusted employee had been stealing from the company.

The Springfield episode ended when Robbins, an ardent patriot, enlisted in the Army in 1918. A second lieutenant in the Sanitary Corps, he was sent to Yale to study bacteriology, but the war ended before he could be sent abroad.

#### THE UNIVERSITY OF MISSOURI (1919–1938)

After a stint of a few months in Washington, D.C., where Robbins was a soil biochemist with the U.S. Department of Agriculture, he accepted a post as professor and chairman of the Department of Botany at the University of Missouri. In September 1919 the family moved to Columbia, Missouri. With a beginning salary of \$2,400 a year, Robbins was expected to teach all courses in botany and only after 1924 was able to shift the beginning courses to Dr. H. W. Rickett.

Rather unusually for his time, Dr. Robbins liked and respected women as scientists. He himself had many female graduate students and assistants and in 1936 persuaded Dr. Barbara McClintock to come to the University of Missouri. She stayed six years working on the genetics of corn, and he gave her fine work the same due he gave to that of his male colleagues.

When Robbins moved to the University in 1919, his administrative duties were limited to the usual hiring of staff and selection of students for graduate study. When he returned there from Europe in 1930, he added the responsibilities of dean of the Graduate School and—during Walter Williams' absence in 1933–1934—of acting president of the University.

In 1935, Franklin Roosevelt established the Works Progress Administration (WPA), which made funds available for new building and improvements. Robbins was immediately ready with the University of Missouri's construction plans,

and, under his direction, the University was able to complete its library, several classroom buildings, a small research building on the shores of Lake Lefevre, and many badly needed improvements.

Yet Robbins managed to live strictly within his means. He did not spend money he did not have and deficits, under his management, did not occur. Imbued with the idea that authority meant acting in the best interests of the organization, he was also ready when necessary to give corrective interviews, change his subordinates' jobs, and let staff go. He tried not to let his personal opinions influence his judgment and withstood personal rebuffs with indifference. He did not compromise on certain matters of personal behavior, and some considered him "stuffy." Yet his sound fiscal policies gave stability to the institutions he managed, and if his efforts were not universally appreciated, he managed to instill unflagging loyalty in those who worked with him most closely—H. W. Rickett, E. E. Naylor, W. E. Maneval, and C. M. Tucker.

Highly intelligent, well educated and organized, Robbins enjoyed his work and worked hard. He always found time for reading—*The New York Times*, magazines, and books—if not for social activities. During the four months before moving to New York, he was able to finish a substantial part of his pioneering work on the growth of excised roots and the vitamin requirements of fungi.

#### THE NEW YORK BOTANICAL GARDEN (1938–1958)

##### *Cleaning House*

When they visited England's Kew Gardens in 1888, Dr. and Mrs. Nathaniel Lord Britton were so impressed they decided, on their return home, to establish a Botanical Garden in New York. The Garden, managed by the private, nonprofit corporation they began, is also a public institution supervised by the City Parks Department. The city owns the 250-acre

public park complete with renowned rose and rock gardens and magnificent display houses; the corporation owns the contents.

As a scientific institution, the Garden in its early years was best known for its taxonomic work and some outstanding research in plant physiology. A leading mycological journal and several taxonomic publications were also edited there. Until 1930 Dr. Britton was the Garden's nominal director (though he invariably left New York during the winter months), but it had been operating under acting directors for years when Robbins arrived to take over on March 1, 1938.

Robbins quickly learned that his new job was more challenging and onerous than that at the University of Missouri. The senior staff consisted of Dr. Fred J. Seaver (mycology), Dr. Arlow B. Stout (compatibility in higher plants), Dr. B. O. Dodge (a plant pathologist who, in 1928, had done the ground-breaking work with *Neurospora* in microbial genetics), Dr. Henry Allan Gleason (head curator and chief taxonomist of the higher plants), and Dr. John Hendley Barnhart (the librarian, who obtained prized books for the Garden even if it meant buying them himself).

Dr. Britton had wanted the Garden to function as the Botanical Department of Columbia University, but this was not to be. As head of the Columbia department, Robert A. Harper also held a seat on the Board of Managers of the New York Botanical Garden, and when the two men were at loggerheads, relations between the institutions cooled. When Harper retired, Robbins was able to establish a program with Columbia and with Fordham University (whose campus adjoins the Garden) whereby graduate students could receive degrees for work at the Garden. The funds he obtained encouraged students, more of whom chose the taxonomy of the higher plants than any other botanical discipline.

Neglected administratively for many years, the institu-

tion's staff was depleted yet contained many in need of superannuation. It had no policy for retirement, few young people, and no long-term goals. Over the next several years, Dr. Robbins strove to change this condition of institutional anarchy.

Keeping the administrative structure he found in place, he used scientific production as his only yardstick, retaining many whom others would have fired on grounds of age or behavior. If someone was a bad administrator but otherwise useful, Robbins either did the administrative work himself or assigned it to others.

He dealt even-handedly with all facets of the Garden. He established a two-year training course for professional gardeners, who were badly needed to staff the private gardens in the area. He gave the study of South American flora (a long-term interest of taxonomists) a great boost by bringing in Bassett Maguire as its head. He promoted horticultural activity, through flower shows and prizewinning displays. As financial capabilities permitted, he increased and improved the Garden's plantings.

To alleviate the plight of the city employees who worked a seven-day week operating the power plant in the winter, he asked the Parks Department every year for more men, and, in 1945 he got them. City employees were becoming unionized at about that time. Although Dr. Robbins was opposed to unionization, he negotiated the Garden's first contract with its union employees. Because he could not tolerate dishonesty and expected employees at all levels to earn their pay, he was unpopular with some, but a member of the first union negotiating committee said that the committee trusted whatever Robbins said.

In addition to dealing with the Garden's staff, employees, and Board of Managers, Robbins immediately established friendly working relations with Columbia University, Com-

missioner of Parks Robert Moses, Mayor LaGuardia, the president of the Borough of the Bronx, Fordham University, the WPA, and the local horticultural societies. One of his first acts was to revive the moribund Women's Advisory Council, which he then used effectively to improve the Garden, even persuading the Board of Managers to elect women to its ranks.

During Robbins's tenure, the Garden had two presidents of the Board of Managers—Joseph S. Swan and Charles B. Harding, both ardent gardeners and both partners in the investment banking firm, Smith, Barney, & Co. Dr. Robbins and the two presidents became close personal friends, and he kept them informed of his actions and anything that might affect the welfare of the Garden. He often sought the advice of Harding, in particular, whose business and social contacts provided potential sources of funding for the Garden. Dr. Robbins's infectious enthusiasm for the New York Botanical Garden untied many a private purse string, and the team of Swan, Harding, and Robbins proved highly successful as fund raisers. They were equally effective in dealing with Parks Department Commissioner Robert Moses, without whose support and permission no substantial changes could be made in the Garden's buildings and grounds.

With the money they raised and 180 WPA workers, Robbins was able to reconstruct the fifteen display houses of Range 1, so deteriorated from neglect they had to be replaced from the ground up. (This was recently done again with private funds.) WPA workers also built propagating houses and manure pits, a rock garden, a bridge, and roads inside the Garden. They did extensive repairs on the Museum Building and cleaned the bronze statue in front of its patina. He had WPA workers mount the million herbarium specimens that had accumulated over the previous forty years and was even able to get a fence built around the Gar-

den. He then began to raise money to support the scientific functions of the Garden staff and each year tried to get more money from the City for custodial and maintenance work.

As if this were not enough, Dr. Robbins also strove to raise money for the National Arboretum in Washington, D. C., on whose advisory council he served. Pointing out the Europeans' superior record regarding support for botanical gardens, he wrote:

"... Kew, for example, which has an area about the same as the New York Botanical Garden and an annual attendance of approximately the same as ours, maintains forty-five uniformed policemen and 100 gardeners and assistants. This compares to our half-dozen elderly guards and thirty-six gardeners and assistants. A comparison with the National Arboretum would, of course, be [even more] striking."<sup>5</sup>

#### *Harding Research Laboratory*

When Robbins arrived at the Garden he found no laboratory for plant physiology. On the ground floor of the museum building where the carpentry shop had been he brought in water, gas, and electricity; purchased a sterilizer and water-distiller; installed a hood; and constructed a transfer room where dirt, dust, and spores were filtered from the air. He converted display cabinets into constant-temperature incubators for growing fungi and roots, and when he was finished, he had the first laboratory of its type in the United States.

By the fall of 1938, he had recruited Drs. Mary B. Schmitt and Frederick Kavanagh from Missouri and five WPA workers for the lab. He selected many high quality scientists for the Garden, including John Wurdack and Richard Cowan as graduate students in taxonomy, Bassett Maguire as the ex-

<sup>5</sup> William J. Robbins, "The Palms: An Appreciation," *Bull. Fairchild Trop. Gard.*, (1954):7-11, and "The Palms," *J. N.Y. Bot. Gard.* 4(1954):83-84.

pert on South American plants, P. P. Pirone to succeed B. O. Dodge as plant pathologist, Clark Rogerson as mycologist, T. H. Everett and Louis Politias as horticulturists, H. W. Rickett as bibliographer, Elizabeth Hall as librarian, and Marjorie Anchel as the lab's principal chemist. The six laboratories Robbins eventually had fitted out in the museum's east basement saw a good deal of first-class research in plant physiology, mycology, virology, and biochemistry related to plants.

Then in the early 1950s, Robbins obtained substantial private funds to construct a separate research laboratory. Finished on October 24, 1956, it was later named the Charles B. Harding Laboratory in commemoration of Harding's thirty years of devoted and effective service to the Garden, Robbins having refused to have it named after himself.

The official working day for the scientific staff was nine to five, but Dr. Robbins was usually in the laboratory before eight. Promptly at nine he went up to his office to meet with the five or six heads of operating departments. After the meeting, he addressed the same courteous attention to letters from Commissioner of Parks Moses as to those from children asking about plants. Few days passed without at least one visitor, and there was always something to be planned or something to be negotiated with the Parks Department.

Every day Robbins spent at least an hour in the lab and walked around the Garden, observing what was done and what needed doing. He discussed problems and progress with each staff member at least once a month. Fund raising often spilled over into the evenings, and he and Mrs. Robbins had a heavy official social schedule. The record shows he spent more time and effort on Garden affairs than on his own research, which, however, continued very productively.

As director of the New York Botanical Garden and Laboratory until his retirement in 1958, Robbins carefully se-

lected its staff from the fields of mycology, tissue culture, plant physiology, and chemotaxonomy, as well as the more traditional botanic disciplines of bio-and organic chemistry. He obtained the long-term grants that insure the stability necessary for extended scientific work and created an atmosphere congenial to interdisciplinary research of a kind all too rare in academic settings.

After his retirement the Robbins spirit continued, even among Garden staff who had never worked with him. This continuity contributed greatly to the lab's scientific success. Today scientists all over the world recognize the contributions of the laboratory Robbins established and ran, and whose principal investigators were supported by the National Institutes of Health for forty-two years.<sup>6</sup>

#### FAIRCHILD TROPICAL GARDEN, FLORIDA

William J. Robbins was one of the first persons Col. Robert H. Montgomery consulted when planning the Fairchild Tropical Garden. Montgomery, inspired by David Fairchild's *Exploring for Plants*, dedicated the Fairchild Tropical Garden in March 1938 so that others might see and study the finest collection of tropical plants possible.<sup>7</sup>

Dr. Robbins served on the Fairchild Garden's Board of Trustees from 1948 to 1962 and as its president from 1962 to 1969. After Montgomery's death in 1953, his voice on the advisory committee became even more influential: "Dr. Robbins proved to be a mentor who could provide both inspiration and practical advice, for there was hardly any area

<sup>6</sup> NIH supported research in the Harding Laboratory for twenty years under Robbins's direction and twenty-two after his retirement. The New York Botanical Garden has now established different goals, however, and the research laboratory is being phased out.

<sup>7</sup> Lucita H. Wait, *The Fairchild Tropical Garden—The First Ten Years*, New York: Ronald Press, 1948.



in which he lacked experience, as a teacher, researcher, administrator. . . .”<sup>8</sup>

He was most influential in strengthening the Fairchild Garden’s scientific research program. In 1959, for example, when Col. Montgomery’s widow, Mrs. Alvin R. Jennings, began the Montgomery Foundation, Robbins suggested that it devote its resources to research in tropical botany and horticulture. On May 5–7, 1960, Dr. Robbins chaired the National Academy of Sciences’ Conference on Tropical Botany at the Fairchild Garden, attended by thirty-five of the world’s outstanding botanists and funded by the National Science Foundation.

In 1966, the NSF approved a grant of \$153,000 to build and equip a major research facility at the Montgomery Foundation on property leased from the Fairchild Tropical Garden. Dedicated March 8, 1967, the tile-roofed William J. Robbins Plant Science Building houses a herbarium and reference library, plus facilities for investigations on the anatomy, physiology, and genetics of plants.

#### RESEARCH

“The research of Dr. W. J. Robbins covered a long period chronologically and was channeled in several distinct lines involving both the higher and the lower plants. He was the American pioneer in plant tissue culture and published a method of transferring root tips through several generations in 1922. This achievement undoubtedly stimulated research by others leading to successful continuous cultures. His later studies with tomato root tips showed that they synthesize both biotin and pyridoxin in the presence of thiamin. He was particularly interested in vitamin relationships to plants at this period and began to study these and other growth factors in relation to the lower plants such as *Euglena* and many fungi, particularly those of dermatological interest and the wood rotting basidiomycetes. He was able to demonstrate that ferulic acid and several fatty

<sup>8</sup> N. Smiley, “William J. Robbins: Indomitable Scientist,” *Fairchild Trop. Gard. Bull.* 33(October, 1978):28–31.

acids were growth factors for a *Polyporus*. The scope of studies was broadened to involve also environmental factors of light and temperature. Many antibiotic substances were discovered not only from fungi but also from higher plants such as *Cassia*.

“. . . One long continued interest, which he pursued vigorously during his long retirement, was in the phenomenon of topophysis exhibited by some plants or the striking dimorphism exhibited by some plants—both in the gymnosperms and angiosperms as they progress from the juvenile state to maturity, and [in] the capacity to form seeds. He showed that hormones could influence these changes when he caused mature English ivy to produce juvenile-type growths by repeated sprayings with gibberellin. He also used tissue culture methods to study this phenomenon. His evaluation of the importance of this phenomenon in horticulture [has been] justified, since reversions to juvenile growth are being used to start successful tissue cultures of certain woody plants.

“He maintained a parallel interest in the chemical and environmental factors involved in the reproductive cycles of fungi. Some notable discoveries regarding the life cycles of fungi were made in his laboratory and also by other staff at the Garden.”<sup>9</sup>

Over the years his methodical attack enabled him to isolate the essential mineral or organic nutrients required for most fungi, except morels, filling in many gaps in the knowledge of the physiology of the lower plants.

### *Root Tips*

Interested throughout his life in the growth and development of plants, Robbins's interest was piqued by Jacques Loeb's observation that a hormone produced by the leaf of *Bryophyllum* conditioned the development of roots in the leaf notches. In 1917 Robbins suggested that Loeb's hormone might be sugar because the root lacked chlorophyll and was unable to synthesize its own carbohydrates. To test this hypothesis he compared the growth of excised root tips from

<sup>9</sup> Vernon Stoutemeyer, personal communication, 1980.

corn, peas, and cotton—the seeds at hand—in a mineral salts solution with that of root tips in mineral salts and sugar.

He found that glucose, though essential to growth, was not the whole story. Successive subcultures from roots grown in the solution containing glucose soon stopped growing. Corn roots would grow through two subcultures but not in a third. Something besides sugar, therefore, was needed to permit continued growth of corn roots. When Robbins sent his findings to Loeb, he wrote back encouraging him to continue his research, but the work was interrupted in the summer of 1917 when Robbins moved to Massachusetts to run his ailing father-in-law's hardware company.

Coming to the University of Missouri in 1919, Robbins resumed his work on the cultivation of excised roots. He worked alone or with Dr. Willis E. Maneval, an excellent technician who taught bacteriology, mycology, and beginning plant pathology. (In 1928–1929, when P. R. White was in the department, it was Maneval who taught him sterile techniques.) Robbins published the 1917 work in the first of the 1922 papers. In the second 1922 article he published work done with yeast extract added to the medium. He made this addition knowing the extract to contain vitamine—which increased growth in animals, bacteria, and yeast<sup>10</sup>—and found that medium containing yeast extract was capable of supporting unlimited growth of tomato roots.

About 1921, Robbins sent the results of the 1917 work with peas, corn, and cotton—all important agricultural products in Alabama—to Professor Gottlieb F. J. Haberlandt, the eminent German plant physiologist. Reply to the letter came in 1922 in the form of a publication by one of Haberlandt's

<sup>10</sup> Only vitamine was known in 1917, the vitamin complex not yet having been dissected. The yeast extract Robbins used in his experiments contained thiamine, pantothenic acid, nicotinic acid, biotin, pyridoxine, and PABA. The most important ingredient for excised roots was thiamine, isolated in 1933.

students, Walter Kotte. Kotte had grown beans, corn, and cotton root tips with the same results as Robbins. The Robbins letter was not cited.

Robbins's root work seemed to reach a dead end in 1923, and he switched his attention to other subjects. Aside from one paper in 1924,<sup>11</sup> he did not deal with excised root tips again until 1934, following P. R. White's publications on the cultivation of tomato roots in a mineral solution containing yeast extract and sucrose.

At that time Robbins obtained a small amount of vitamin B<sub>1</sub> (thiamine), newly isolated in crystalline form, from R. R. Williams and showed that it would substitute for yeast extract in permitting unlimited growth of excised tomato roots. Thiamine had been established as an animal vitamin but not as one for plants. Robbins's experiments with tomato roots and fungi supported the idea that all life required thiamine. (James Bonner was also working in this field, and the two were in constant touch keeping each other apprised of progress.)

Robbins's last publication, with Mary Stebbins, on the growth of excised tomato roots, came out in 1949. The roots were in the 144th passage, the last 131 of which had been maintained in a solution limited to mineral salts, cane sugar, and thiamine or thiazole for more than twenty years.

### *pH*

Though Robbins had relatively little time for research from 1926 to 1935—concentrating instead on teaching, administration, his European sojourn, and writing the textbook of botany he published with H. W. Rickett in 1929—he did address the problem of hydrogen ion (pH) concentration. In

<sup>11</sup> W. J. Robbins and W. E. Maneval, "Effects of light on growth of excised root tips under sterile conditions," *Bot. Gaz.* 78(1924):424-32.

the early 1920s, the importance of pH concentration to the toxicity of acidic and basic dyes, the action of acidic and basic drugs, the staining reaction of dyes, and the solubility of proteins was just beginning to be appreciated. Buying a Clark & Lubs hydrogen electrode apparatus for measuring the hydrogen ion concentration of solutions, Robbins measured isoelectric points of many plant tissues and showed its importance to absorption and toxicity. His last publication in this field was in 1935, on the effect of dyes in yeast fermentation as influenced by hydrogen ion concentration.

### *Fungi (1935–1945)*

In the decade from 1935 to 1945, Robbins's lab was primarily given over to the study of the effect of B-vitamins upon the growth and fruiting of fungi and the germination of fungal spores. During World War II, Robbins began a screening program for antibiotics produced by *Basidiomycetes*, a fungal group not previously surveyed. The first group of these wood-destroying fungi (obtained from Ross Davidson and Frances Lombard, USDA) showed promise, and he attempted to obtain as many isolates of wood-destroying basidiomycetes as possible. Annette Hervey developed the techniques for screening the fungi and, after reporting on the first 500 cultures in 1947, continued with additional isolates that eventually totalled over 3000 cultures. In the first decade of effort, the researchers isolated more than a dozen new antibiotic substances and published forty-four papers.

Robbins's mycological and chemical studies—done collaboratively with Frederick Kavanagh, Marjorie Anchel, Alma Barksdale, Trevor McMorris, M. S. R. Nair, and Susan T. Carey and supported by NIH—showed fungi metabolites to be of interest far beyond their antibiotic activity. To date some fifty of the new compounds have been discovered with antibacterial, antifungal, antitumor, antileukemic, and cardi-

otonic activities. Many had novel structures, and Robbins's lab was the first to isolate from fungi members of such classes of compounds as monoterpenes, sesquiterpenes, and a monoterpene with the structure of an alkaloid. Robbins's lab was also first in isolating, determining the structures of, and synthesizing steroidal fungal sex hormones. The lab's nutritional studies identified active substances in natural preparations to improve the growth of certain fungi in a "complete" medium, and in 1947, supported by a grant from the National Foundation of Infantile Paralysis, it initiated a six-year program to screen actinomycetes for antiviral activity.

Shortly after *Euglena gracilis* var. *bacillaris* was shown to exhibit a quantitative growth response to crystalline antiper-nicious anemia factor (Vitamin B<sub>12</sub>), Robbins started to search for its primary source in nature. He found major sources of Vitamin B<sub>12</sub> in bacteria, actinomycetes, and blue-green algae—but not green algae and higher plants.

Intrigued by challenging and difficult problems, he spent time trying to cause *Morchella esculenta* to fruit. Encouraging his associates on this quest, he told them repeatedly how delicious morels were sautéed in butter. This was followed by the promise of a champagne party to celebrate success, but *Morchella*, unfortunately, refused to cooperate.

In 1963 at the Cosmos Club in Washington, Robbins had a casual conversation with Dr. Neal Weber (who had received an NRC Fellowship in 1934 when Robbins was chairman of its National Fellowship Board in the Biological Sciences) that led to a project to identify the fungi that leaf-cutting ants cultivated as food in underground "gardens." Thirty-six isolates collected by Weber were preserved at the Harding Laboratory, one of which fruited in culture and was identified by the Garden's Clark T. Rogerson as a species of *Lepiota*. From it, Robbins's lab isolated and elucidated the structures of two metabolites with antileukemic activity.

Robbins's laboratory technique was impeccable. Many experiments required chemically clean and bacteriologically sterile glassware, and he invariably used distilled or redistilled water. The importance of this was illustrated by the case of the bacteriologist who used deionized water—thinking it equivalent to distilled water—and failed to confirm Robbins and Hervey's 1944 report of *Pythiomorpha gonapodyides*' high manganese requirement.

### *The Rockefeller University*

After Robbins retired from the New York Botanical Garden, he began a laboratory at the Rockefeller University, where he embarked on new research whose uncertainty would have daunted a younger researcher. But they were fun, and at his age, he decided, he had nothing to lose.

For many years Robbins had been fascinated by the sharp physiological and morphological differences separating the juvenile and adult stages of *Hedera helix*, and the fact that gibberellic acid applied to adult *Hedera* caused reversion to the juvenile form. With leisure to study *Hedera helix*, he tracked the growth rate of calluses in adult and juvenile plants, finding that callus from the latter always grew faster. Juvenile callus maintained its differences from adult callus through fifty-four passages extending over a period of about six years. He also studied the development of plants from leaf discs of variegated *Coleus* as related to patterns of leaf chlorosis.

In 1965, Robbins's essay on topophysis<sup>12</sup> won the American Philosophical Society's Lewis Prize and revived interest in the subject. Topophysis—important to nurserymen—is the phenomenon that occurs when the part used to propa-

<sup>12</sup> W. J. Robbins, "Topophysis, a problem in somatic inheritance," *Proc. Am. Philos. Soc.* 108(1964):395–403.

gate a plant determines the plant's morphology and physiology.

Robbins's most popular later publication was the note he and Annette Hervey wrote on the toxicity of distilled water stored in "inert" polyethylene bottles (1974). They had used excised roots of *Bryophyllum calycium* (sensitive to material leached from the plastic) as a test subject, making the span of Robbins's work with excised roots more than sixty years. Of the thirteen research papers published from his Rockefeller laboratory, ten were on some aspect of tissue culture of plant parts or topophysis and three were about growth factors for higher fungi.

"He succeeded—where so few do," said an admiring Maclyn McCarty in 1980, "in maintaining a lifelong commitment to laboratory research even after becoming a senior statesman of science."<sup>13</sup>

#### EDUCATOR AND TEACHER

Dr. Robbins was an outstanding teacher with a great fund of knowledge and lucid style. He taught undergraduates at Lehigh, Cornell, Auburn Polytechnic Institute, and Missouri and graduate students at Missouri and Columbia, keeping their interest by asking questions and interjecting stories, many of them humorous.

At Missouri he gave three five-hour courses in plant physiology. This meant three one-hour lectures each week and two two-hour laboratories. Sitting at his table in front of the room, he talked and smoked his pipe, covering the material in unhurried detail. Beginning with no textbook, he used his magnificent collection of reprints to keep his lectures current. Though material he taught bored him, students never detected that it did. As for the plant physiology laboratory,

<sup>13</sup> Maclyn McCarty, *Memorials of the Century Association*, New York, 1980, pp. 304–6.



he trusted the competence of his graduate assistants and rarely appeared.

He himself supervised relatively few graduate students. During the Depression years of 1930 to 1937, the number of graduate students was limited by University funds available to pay them. What with research funds limited to several hundred dollars a year and the military drain of World War II, few students were available. Robbins never sought to dominate those he did supervise, but rather kept in close touch with their work in the laboratory while allowing them to use their own judgment.

His own laboratories were relaxed places to work. Never in competition with anyone else, he felt free to devote the time required to do a complete job. He spent hours writing up observations so that when he went back to them later the information was there. His notes fill many bound laboratory notebooks.

*Botany* (New York: D. Van Nostrand Company, 1929–1939), the textbook Robbins wrote with Harold W. Rickett, sold very well and went through three editions in ten years. For the first edition, Robbins wrote on taxonomy, morphology, anatomy, and evolution; Rickett on physiology parts. The manuscript was then worked into a book by the authors and the teaching staff.

During his two years abroad from 1928 to 1930, Robbins visited botanists in every country of Europe except Greece, Spain, and Portugal, evaluating research projects proposed for Rockefeller Foundation grants and interviewing scientists—including one Polish couple, studying coprophilous fungi, with whom his only common language was Latin! Given his own rigorous standards, he was shocked by what he found:

“One of the most important things which a teacher or investigator must do is to familiarize himself with the literature in his special field and related

fields. Some years ago I spent two years with the European office of the Rockefeller Foundation. I was astonished to find that many of the outstanding European biologists depended very largely on reprints sent them by their colleagues and very little on abstract journals or the journals themselves. In many instances, I found notable gaps in the acquaintance of outstanding men with publications in their field."<sup>14</sup>

As dean of the Graduate School at Missouri, Robbins supported graduate studies in all fields. Of the opinion that work done in education did not deserve a Ph.D., however, and that granting it would degrade the quality of that degree, he opposed a Ph.D. program in education. He was equally certain that the state legislature would not finance both a University and a four-year medical school adequately so that, if a medical school were established, the University would suffer. (The University had, at that time, an excellent two-year program in medicine whose graduates—including Robbins's son Frederick—went on to complete their studies at excellent four-year schools elsewhere.) Using a standard bureaucratic technique, he appointed a committee to study these matters. It was never able to reach a decision, and nothing was done until he left in 1938.<sup>15</sup>

From 1931 to 1937 Dr. Robbins served as chairman of the National Fellowship Board in the Biological Sciences, a National Research Council committee that granted NRC post-doctoral fellowships supported by Rockefeller Foundation grants. These were given in the fields of agriculture, anthropology, botany, forestry, psychology, and zoology. In the first fourteen years of its existence (1923–1937), the Board considered 1,414 new applicants, of whom 398 became NRC fellows and went on to be America's most productive biological scientists. At the end of his service as chairman, Robbins

<sup>14</sup> W. J. Robbins, letter to Dr. Carl G. Hartman, 1948.

<sup>15</sup> Shortly after Robbins left Missouri a Ph.D. program was established in education. The University obtained a four-year medical school after World War II.

made a detailed analysis of the sources of fellows' undergraduate training, finding that their undergraduate degrees came from 158 colleges and universities in the U.S. and Canada. Many of these institutions had enrollments of 500 students or less; schools with enrollments of less than 3,000 accounted for about half the fellows; while some large schools counted no fellows among their graduates.<sup>16</sup>

After World War II, certain influential people in the National Academy of Sciences wanted to give most federal funding for education to the East coast universities and the University of California at Berkeley. Knowing that many good people were educated in schools without great reputations throughout the country, Dr. Robbins opposed this. His proposal to allocate at least twenty-five percent of the funds to lesser known schools was defeated, with serious consequences for research in universities—as is now becoming evident.

Writing in 1935, he summarized his strong views regarding research as a crucial part of scientific training:

“I conceive research as an attempt to answer questions or to solve problems by a method which involves three steps: first, the definition, analysis and comprehension of the problem; second, a search for the solutions or answers; third, the testing of the solutions by reasoning, by experimentation if possible, and by checking the proposed solutions against the knowledge we now have.

“The highest type of research is that kind the results of which increase the sum total of human knowledge, add new knowledge to that which we have. In the minds of many this alone should be regarded as research. I prefer, however, to consider as research every attempt to answer a question or to solve a problem by the method indicated above, whether it reveals knowledge as yet unknown to the world at large or whether it merely adds to the knowledge an individual may have.

“It is my firm conviction that the chief business of education is the development in the student of the power to solve problems. I am con-

<sup>16</sup> W. J. Robbins, “National research fellowships in the biological sciences,” *Science* 86(1937):429–34.

vinced, also, that this power cannot be given by *ad hoc* or particulate training, by supplying the students with ready-made solutions, by training them in techniques or skills. Not only because we cannot foresee the problem an individual will meet, the questions which will be presented to him, but because there are too many problems in life for which to supply an individual with ready-made solutions and because new times bring new problems. For these new problems, solutions must be found and new solutions for the old problems devised.”<sup>17</sup>

#### FISHERMAN: QUARTET CAMP, MAINE

Dr. Robbins became an expert fly-fisherman as a boy and continued the sport throughout his life. During the 1930s the Robbins family spent their summers in the Rocky Mountains, Michigan, and Canada, backpacking in to find good trout streams and lakes. On these outings Robbins had fresh fish for breakfast every morning, for Mrs. Robbins dearly loved to eat the fish he so enjoyed catching.

From his late sixties and over the next dozen years, Dr. Robbins cured his annual attack of “spring fever” with a fishing trip to Quartet Camp in Maine. In addition to the spectacular flora and fauna of the deep woods in early spring, the camp offered a unique group of distinguished older men addicted by the thrill of fishing for landlocked salmon just after ice-out in April. These included the president of MIT, Dr. Karl T. Compton; the pioneer aeronautical engineer, Dr. Jerome C. Hunsaker; the famed aviator, Lt. Gen. James Doolittle; Vice-Admiral Emory Land; the noted cardiologist, Dr. Paul Dudley White; and Senator Ralph Flanders of Vermont—most of whom Dr. Robbins survived.

For two weeks, six or eight fishermen and an equal number of guides, cooks, and boatmen gathered at the camp. Its remoteness on Grand Lake, with no road, no electricity, no

<sup>17</sup>W. J. Robbins, “The graduate school and research.” *Gamma Alpha Rec.* 25(1935):79–84.

telephone, appealed to Robbins, who liked to hear loons call at night; sight deer, osprey, and eagles; and tell fish stories.<sup>18</sup>

#### LAST DAYS

Robbins smoked cigars, cigarettes, and a pipe during much of his adult life and in 1957 could not walk a block without having to stop three or four times because of pains in his chest. On January 1, 1958, after a heart specialist had diagnosed cardiac insufficiency, he resigned as director of the New York Botanical Garden, put his affairs in order, and prepared to die at any time. Then Mrs. Robbins suggested he stop smoking cigarettes, which he did, and his anginal pain cleared.<sup>19</sup> As his health improved and he realized death was not imminent, he took on many administrative assignments and established his own laboratory at the Rockefeller University.

The last few years of Robbins's life were made difficult by his wife's lingering illness and her death in 1974, as well as his own cataract operations and increasing deafness. When he could no longer hear conversations even with a hearing aid, he stopped going to meetings and conferences.

Dr. Robbins walked the quarter-mile between his apartment and the Rockefeller University every day, but in 1976 his legs began to give him problems and his physician told him to stop smoking entirely. He went home, put away his pipes, gave away his tobacco and cigars and—breaking a habit of sixty years' standing at the age of eighty-six—never smoked again. Still, the circulation in his legs did not improve. On October 1, 1978, he suffered a massive stroke. He died on October 5 at the New York Hospital, having worked

<sup>18</sup> Personal communication from J. Hunsaker, Jr., to Annette Hervey, February 22, 1979.

<sup>19</sup> W. J. Robbins in a taped interview with C. R. Long, *N.Y. Bot. Garden Oral Hist. Prog.*, July 20, 1973.

the day before in the laboratory as usual. All his bills were current. His ashes are buried beside his wife's in Montoursville, Pennsylvania.

#### HONORS AND DISTINCTIONS

In 1941 Dr. Robbins was elected to membership in the American Philosophical Society, the oldest and one of the most distinguished learned societies in America, started by Benjamin Franklin in 1743. He was its president from 1956 to 1959 and was executive officer in 1960 when the Society's million-dollar Benjamin Franklin Library was completed. David R. Goddard published a biographical memoir of Robbins in the Society's *Yearbook* in 1980.<sup>20</sup>

Elected to the National Academy of Sciences in 1940, he was its treasurer from 1948 until 1960. At the request of General MacArthur, he and five other Academy members formed a Scientific Advisory Commission to Japan in 1947 to evaluate Japanese scientific activities and suggest future directions. According to Dr. Robbins the Commission's real mission was to reestablish contact with Japanese scientists, which they did.

Robbins was also a member and director of the Boyce Thompson Institute for Plant Research, Inc., for twenty-nine years and a member of its Executive Committee for twenty-four years. In 1973, the Institute passed a resolution honoring him that stated:

"... His consistently offered wise counsels ... on matters both large and small and has been an inspiration to its managing director and scientists."

He was a trustee of the Rockefeller University from 1956 to 1965. Upon establishing his laboratory at the University, he

<sup>20</sup> David R. Goddard, *Yearb. Amer. Philos. Soc.*, 1980, pp. 100-1.

became Trustee Emeritus, avoiding thereby even the appearance of conflict of interest.

A life member of the Torrey Botanical Club, Robbins was elected president in 1943 and served on the nominating, program, grants, and endowment committees. His good advice helped the Club's treasurer to increase the return on the endowment funds from one to five percent and more, and he often advised the Council and the officers of the Club unofficially. He was a guest speaker on several occasions and published frequently in the *Bulletin*.

#### MAN AND SCIENTIST

Dr. Robbins believed in authority and respected the requests of those in positions of responsibility. Living this way himself, he expected others to. Though he did not always agree with the Board of Managers at the Garden, he lived under their control, even turning down requests from the U.S. State Department because of their objections. He was, however, a steady influence on the Board. Once, when several women of the advisory council were offended by a supervisor's abusive language, he smoothed the situation over by creating a non-supervisory post for the man rather than firing him.

Many who criticized Robbins for a certain managerial and social rigidity did not realize that he was upholding standards of a managerial Board not always in agreement with those of the community. He also had no administrative assistant in the early days and could not do everything requested of him. Staff members trying to obtain funds for their own activities resented his apparent unresponsiveness, though they often benefited by becoming more self-reliant as fund-raisers. Robbins had a well-developed sense of humor and in his younger days played practical jokes and was a great tease.

Those who thought him stuffy never realized that his delightful humor could be so dry as to be dusty!

While at the University of Missouri it was Dr. Robbins's practice to go through Lefevre Hall upon his return from summer vacation shaking hands and talking with the permanent support staff, including the two Negro janitors. For a white man to shake hands publicly with a Negro in Columbia, Missouri, in 1932 was very unusual, but Robbins treated everyone with the same courtesy.

Despite his stringent standards for himself, he had an extraordinary tolerance for error and incompetence in the people who worked for him. He rarely lost his temper, and when he did the outburst was brief. He respected opinions even when they differed radically from his own—a kind of forbearance that is considered a handicap in an administrator today.

To Robbins, the most exciting thing in life was to identify a problem in nature and attempt to solve it. He was happiest when he was in the laboratory, yet he spent most of his time in administration, leaving little time to do what he liked best. After refusing many full-time administrative positions (including the presidencies of several large universities) he took the job at the New York Botanical Garden in the expectation of having more time in the laboratory. In reality, he had no more time for research there than he had had at Missouri.

Yet he enjoyed position and power and often accepted calls upon his time he could have avoided. He valued his own satisfaction and the private opinions of his peers more than public acclaim and was therefore unwilling to have the Garden's research laboratory named after himself. He guarded his good scientific name jealously, reacting vigorously to any fancied or real attempts to obtain unauthorized benefit from association with him. Working ever to the exacting standards of the inner man, he delayed publishing his pioneering work on growth of excised plant roots for six years.



His high principles caused him on at least one occasion to refuse a large increase in salary offered to him by the Board of Managers of the Garden. Although he and his family certainly could have used the money, he felt that an increase for him alone would cause too great a disparity between his salary and that of others at the Garden.

He was one of those rare persons who can project to the future, be it nine months or nine years, and see the consequences of an action taken or avoided today. Spending much of his life with people for whom the future meant next week, he yet obtained their support for his programs by giving thoughtful answers to their questions. He never rushed into projects without first considering their effect upon both the people and the institution.

Finding research important to the welfare of man fun, he preferred to spend his Sunday mornings working in his yard or in his laboratory rather than in church. He professed not to understand preachers, whose sermons made no sense, yet had little patience with those who questioned the value of laboratory work because less than one percent of it was of value. "It may be one-tenth of one percent," Robbins wrote, "But the one-tenth . . . is what has brought us from the darkness and barrenness of the scholasticism of the middle ages."<sup>21</sup> Alone of all the presidential portraits at the American Philosophical Society, Robbins's shows him in a laboratory coat.

Dr. Robbins was a true conservative in the best sense of the word—in matters personal, financial, administrative, political, and scientific:

"Science is democratic, not autocratic, for in science no man's word is taken as law," he wrote with some urgency in the dark years preceding World War II. "Any discovery he makes, any statement given as truth, must be

<sup>21</sup> Geoffrey T. Hellman, "A square deal among the fungi," *New Yorker* (July 19, 1947).

susceptible of confirmation by others. As Sir Thomas Brown says, 'The mortallest enemy unto knowledge and that which hath done the greatest execution unto truth has been a preemptory adhesion unto Authority.'

"Liberty, equality, and fraternity are as necessary attributes of science as they are those of the political philosophy of republican France. Life, liberty, and the pursuit of happiness are conditioned as much by the progress of science as they are by the continuance of our democratic form of government.

"So I would say to the politicians and to the statesman—cherish science, it yields large profits and exemplifies the principles you profess. To the layman—embrace science, it offers you freedom, equality, and fraternity. To the scientists—guard science, lest those who do not understand cripple it with strictures which mutilate its body and destroy its soul."<sup>22</sup>

DOCUMENTS PERTAINING to Robbins's years at the Rockefeller University and the New York Botanical Garden are in the latter's archives along with a twenty-nine-page transcript of his contribution to the Columbia University oral history program. Those from his years at the University of Missouri are in the American Philosophical Society and National Academy of Sciences archives. We were unable to locate reports made to the Rockefeller Foundation for 1928 to 1930. The authors obtained other materials from Dr. Robbins during our long association with him (forty-six and thirty-six years, respectively) as teacher, employer, and friend. In addition his son, William C. Robbins, M.D., supplied biographical information about his father, mother, and grandfather. J. Hunsaker, Jr., furnished the information about the fishing at the Quartet Camp. James Bonner and Vernon Stoutemeyer made evaluations of Dr. Robbins as a botanist and as a friend. Marjorie Anchel provided information about the chemical programs and gave the manuscript a critical reading. Harold Rickett and Carol Woodward read a version of the manuscript and made editorial and factual corrections. We thank these and the others who contributed to this publication. Bernice Winkler, Dr. Robbins's secretary who stayed on at the Harding Research Laboratory after his retirement, deserves special thanks for the assistance she provided.

<sup>22</sup> W. J. Robbins, "Science and Scientists," *Proc. Missouri Acad. Sci.* 3(1937):43-49.

SERVICE TO THE NATIONAL ACADEMY OF  
SCIENCE AND THE NATIONAL RESEARCH  
COUNCIL<sup>23</sup>

- 1976 Member Emeritus of the National Academy of Sciences
- 1962–1965 Chairman, Advisory Committee on Research to National Park Service
- May 1960 Organizer, Conference on Tropical Botany.
- 1948–1960 NAS Treasurer
- 1949–1960 Committee on Chemicals
- 1941–1960 Executive Board of the NRC (Committee on Policies, 1941–1946; Committee on Exhibits, 1945–1947; Acting Chairman, Committee on Insect Control, 1945–1946)
- 1953 Committee on Publications of the Academy
- 1948–1951 Atomic Energy Commission Postdoctoral Fellowship Board in the Biological and Agricultural Sciences
- 1948–1955 Advisory Board on Quartermaster Research and Development
- 1946–1948 Committee on Quartermaster Problems
- 1946–1949 Chairman, Subcommittee on Germicides, Insecticides, and Biologicals
- 1945–1949 Panel on Botany (Chairman, 1946–1948)
- June 1947 NAS Scientific Advisory Mission to Japan
- 1944–1947 Chairman, NAS Botany Section
- 1940–1945 NAS Committee on National Science Fund, (Chairman, Board of Directors, 1941–1945)
- 1941 NAS Finance Committee
- 1940 Member, National Academy of Sciences
- 1931–1937 Chairman, NRC Fellowship Board in the Biological Sciences

<sup>23</sup> We are indebted to Janice Goldblum of the National Academy Archives for this list, which she included in a letter to David R. Goddard on February 15, 1979. We have omitted references to Dr. Robbins's service on temporary, Council, and award committees. *Editor*

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<sup>24</sup> A more complete bibliography appears in the *Bull. Torrey Bot. Club* 108 (Jan.-March 1981): 116–121. Regarding Robbins's published works, Frederick Kavanagh writes: "In a scientific career spanning sixty-two years, Dr. Robbins published at least one scientific article in fifty-six [of them]. He did non-scientific work in seven years. He published in at least seven areas of botany. I have titles of 206 scientific publications. He had twenty-four co-authors. He wrote at least forty popular articles. . . . [His] longest period of collaboration was [with] Annette Hervey, who [worked with him] on thirty-three [joint] publications. She was much more than a collaborator. To do justice to her would take many pages. I [myself] had . . . twenty-three publications with Dr. R." personal communication to the *Biographical Memoirs*, September 24, 1990.

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