MEMORIAL RESOLUTION

LAWRENCE R. BLINKS
(1900 – 1989)

"I first saw the Hopkins Marine Station on the last day of December, 1919. It was the first part of Stanford University that I saw as well as the last—probably—and a place with which I later became connected for the past fifty years." So begins an autobiographical sketch by Lawrence R. Blinks, written six years ago when Lawrence was eighty-three. Lawrence's association continued until his passing away on March 5th of 1989, less than two months short of his 89th birthday.

Lawrence completed two years of undergraduate study at Stanford—from 1919 to 1921—and then two years at Harvard majoring in biology and then graduate school at Harvard in "general physiology." He returned to Hopkins to teach a course in 1931 and was invited back to Stanford as a faculty member in 1933. During his more than fifty years at Stanford he carried out landmark studies in two completely different areas—electrobiology and photosynthesis—was an important administrator of science, both at Stanford and the national level, and following retirement, he was heavily involved in setting up the biological sciences program at the then fledgling University of California campus at Santa Cruz. His recognitions were many, including election to the National Academy of Sciences and the American Academy of Arts and Sciences, serving as president of the Society of General Physiology and Vice-President of the AAAS and receiving the Hale Award of the American Society of Plant Physiology.

Lawrence's life encompassed much of the beginnings of biology as an experimental science in America. Born in 1900 in Michigan City, Indiana, Lawrence's initial interest in science came through the readings of Henry Thoreau, John Muir, and John Burrows as well as the impact of his father, who was trained as a chemist. His freshman year was at Kalamazoo College and while there he spent a summer at the University of Michigan's field station at Douglas Lake, where he took two courses in botany.

Lawrence acknowledged that this experience in the forests of Michigan had a tremendous impact on him and set him thinking about biology as a career path. He transferred to Stanford and spent two years as an undergraduate continuing to develop his interest in biology. Lawrence then transferred to Harvard where he spent an additional two years before graduation. While considering a career as a high school teacher, W. J. Van L. Osterhout, one of his professors, asked him if he had ever considered graduate study. Lawrence replied that it sounded interesting and Osterhout immediately invited him to spend the next year with him at a new field laboratory in Bermuda. Thus began the important scientific development of Lawrence Blinks which ultimately led to his landmark discoveries on the electrical properties of cells and later important insights into the nature of the photosynthetic apparatus of plants.

Blink's initial contributions were on ion permeabilities and their role in generating electrical activity in plant cells—work that was made possible by the extremely large size of the cells of certain species of algae (Nitella, Valonia and Halicystis). Valonia and Halicystis are centimeters in diameter and the cells of Nitella are centimeters long; in them he was able to measure the electrical properties of the cell membranes and relate these to the ionic composition

of the cytoplasm even with the relatively primitive techniques available at the time. Lawrence developed methods to measure the potentials and resistances of the cells and his work formed the basis for much of our understanding of electrical activity of cells, both plant and animal. This work was carried out initially as a PhD student at Harvard University and later as a beginning faculty member at the Rockefeller Institution in New York. Upon moving to New York, Lawrence also renewed his acquaintance with Anne Hof, whom he had met earlier when she was a graduate student in botany at Harvard and again in Bermuda. The relationship deepened, they were married in 1928, and thus began a beautiful sixty-one years relationship.

Lawrence's research continued actively at Rockefeller. They were heady days, since here was Blinks carrying out critical studies on the nature of membrane permeability and electrical activity in large plant cells, whilst other laboratories at the same institute were carrying out similar studies of electrical activity on the nerves of animal cells. Blink's work on plants had the aforementioned advantage of an extremely large cell from which it was easy to get electrical recordings and importantly to compare this with the ionic composition of the cytoplasm. Alan Hodgkin, who later went on to receive the Nobel Prize for his work on the electrical activity of nerve cells, exploited a similar large cell of the squid neuron. In a congratulatory letter

On the occasion of Lawrence's 85th birthday, Hodgkin noted that he had "read all your papers on the large plant cells and had been particularly impressed with those dealing with the increase in membrane conductance during the activity of Nitella. This had a great effect on my scientific development as I have related in "Chance and Design" (a scientific autobiography of Hodgkin).

Lawrence's work on bio-electric phenomena attracted much attention and in 1931 he was invited to teach in the physiology course at the Hopkins Marine Station. Besides the regular Stanford faculty, the staff also included Leonor Michaelis, also of Rockefeller and one of America's most eminent biochemists.

Two years later, in 1933, Lawrence was called back to Stanford as an associate professor of botany. Shortly after, in 1935, this artificial division of the disciplines was broken down and the biology faculty in the botany, zoology, and entomology departments merged into one Biology Department. In this new department, Blinks joined a group of other young people who were subsequently very important both at Stanford and nationally in terms of the development of American biology. The group included four new appointments in biology, Douglas Whitaker and Victor Twitty in embryology and George Beadle in genetics. About that same time the department was visited by an officer of the Rockefeller Foundation who subsequently gave a large unfettered grant to six members of the department to carry on their research. They included C. V. Taylor, Whitaker, Twitty, Beadle, and Blinks on the main campus and C. B. van Niel at the Hopkins Marine Station. The $100,000, to be spent over a period of ten years, was extremely important for carrying forth the science of all of these people and indeed was husbanded for over 15 years. Lawrence referred to this group as "the Rockefeller gang"; it was an eminent group and the seeding by the Rockefeller Foundation clearly bore fruit as indicated by the fact that five of the six were subsequently elected to membership in the National Academy of Sciences.

Lawrence's work on permeability and its relationship to electrical activity of cells continued to occupy his interest, but he became fascinated by the problem of photosynthesis and worked out methods to measure oxygen evolution—a component of photosynthesis—and use

this as a means to look at the action spectrum of the photosynthetic process. Thus began the second chapter of his scientific life, which is the relationship of the plant pigments to the photosynthetic process. His work in the late 1930s and early 1940s on the Stanford campus and then later at the Hopkins Marine

Station was instrumental in pointing to the role of accessory non-chlorophyll pigments in carrying out light capture for photosynthesis. Blink's work with R. K. Skow showing that a platinum electrode could be used to measure oxygen evolution extremely rapidly in algae made obsolete the tedious manometric measurements used until that time. This method made possible a number of new discoveries about photosynthesis, particularly about the oxygen-generation mechanism.

His paper in 1950 with Francis Haxo on the photosynthetic action spectra in marine algae stands to this day as a landmark. This work along with Blinks' measurements on chromatic transients gave support to the idea of Ralph Emerson that accessory pigments and chlorophyll are organized in special ways and that photosynthesis functions with two with two separate photosystems. This work on accessory pigments occupied most of Blinks' career from 1950 until his retirement and indeed many contemporary scientists associate Blinks' name with his research, as indicated by the Blinks effect in photosynthetic transients for accessory pigments, although his earlier work on bioelectrical phenomena was at least equally important.

Lawrence had taught and carried out research at the Hopkins Marine Station during his first years on the Palo Alto campus, and in 1943 Blinks was invited to accept the directorship of the Marine Station. Lawrence's association with field laboratories both at Douglas Lake Station as an undergraduate, his work at Woods Hole, Bermuda and the Dry Tortugas lab must also have been in his mind as he mulled over this important decision. He accepted the post and he and his family moved down to Monterey in 1943, where he remained for the rest of his life. As Director of the Marine Station, Lawrence continued his interest in plant pigments and photosynthesis. After his retirement, he continued his earlier work on the electrical activity of plant cells.

As Director of Hopkins, Lawrence obtained funds for the construction of the Marinostat Building, which was initially designed for long-term culture of marine organisms under varying temperature and light regimes. It has recently been converted into a research laboratory for the current Director and several years ago was renamed the Blinks Building. Lawrence was also instrumental in bringing an oceanographic program to the Marine Station through the interest of the Harold Miller family of Portland, Oregon. They donated the sailing yacht Te Vega which was renovated as a floating laboratory for a major Stanford-National Science Foundation program in oceanography.

Lawrence was also called to duty for important government service. Following the war, he was asked to assess some of the affects of atomic bomb testing on algae at the Bikini Atoll. In 1955, Lawrence was asked to go to Washington to be the Assistant Director of the three year old National Science Foundation. Lawrence stayed there one year before returning to Pacific Grove, managing their then $11 million dollar budget for support of basic research in the United States.

Lawrence was a warm-hearted individual, appreciative of the accomplishments of others, often helping them achieve by sharing facilities at the Hopkins Marine Station, which he carried through a period of scarce funds by dint of doing many things himself that others could have

done had funds been available. One of us (A.C.G.) got started on a program on reproduction of marine invertebrates when Lawrence shared an NSF grant for marine studies. He was excellent teaching in small classes, provoking independent and critical thinking in discussions of original papers. In a class taught jointly with one of us (A.C.G.) we sometimes quizzed each other to the delight of the class. Lawrence often invited colleagues to share his hospitality in his beautiful aerie atop the heights overlooking the sea coast and Carmel. Not only did he treat us to wines he had made but, in absence of Anne, to his culinary skills, with the addition of discussion of problems in science. One of his younger colleagues characterized Lawrence as "the embodiment of the gentleman scientist, never self-seeking, searching for the explanation of life activities, a breed not too common amongst the highly competitive scientists today."

Lawrence "retired" in 1964 but it was hard to tell the difference. One of his first "duties" as an emeritus professor was to be chief scientist on a Te Vega cruise to the South Pacific. Meanwhile, across Monterey Bay, the new campus of the University of California was being established at Santa Cruz and Lawrence was asked to be a professor on that campus. He and his wife Anne moved to Santa Cruz for five years, where he was active in the formation and establishment of their unique and successful program in biological sciences. He retired from that position in 1973.

He continued with his work on electrical potential of cells at the Hopkins Marine Station, maintaining cultures of Valonia for studies on natural oscillations in membrane potential of these cells. He was in the laboratory almost every day and was an active participant in the faculty meeting and seminar programs of the Marine Station.

In 1985 a symposium was held commemorating Lawrence's 85th birthday and honoring his accomplishments in science. Over 100 admirers, former students, and colleagues attended this meeting. Following the meeting, Lawrence went on a trip to Hawaii to collect more Valonia for his research on the aforementioned cyclic phenomena.

Lawrence was always curious and excited by questions of science and a final example is fitting to close this biography. Lawrence was recovering from a first and major heart attack in March and his son John, a pharmacologist at the Mayo Clinic, was staying with him at the hospital and had explained to his father the nature of the repair process. Lawrence was fascinated by it and discussed this with great enthusiasm with visitors during this last stay in the hospital.

Lawrence Blinks, a remarkable man, made important contributions to science both at Stanford and nationally, and was an important administrator of science as well as a memorable husband, father, and colleague.

Winslow Briggs
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