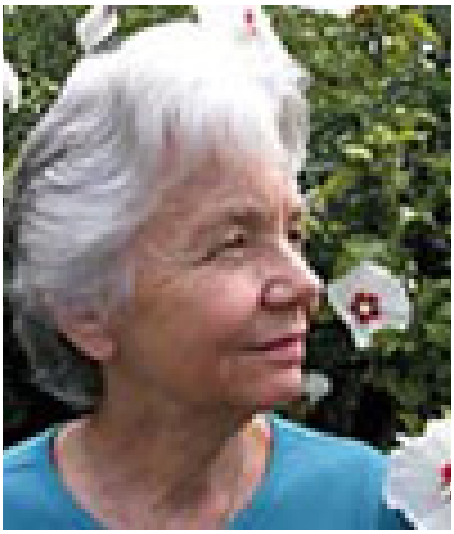
ASPB Pioneer Member

Mary Helen Goldsmith

Mary Helen Goldsmith (née Martin), curious about and loving nature, grew up in Maryland,. She earned a B.A. degree in Zoology and Chemistry from Cornell University in 1955, and a Ph.D. from Radcliff College at Harvard University in 1959. She studied at Harvard with Professor Kenneth V. Thimann,,one of the world's authorities on auxin, at a time when how auxin moved through tissues was a greatly motivating mystery in plant physiology. How could a molecule related to tryptophan move so readily through tissue in one direction but barely budge in the other direction?[1] Why was its transport through tissue, but not its initial uptake into cells, so reliant on respiration?[2] Mary Helen continued to investigate these puzzles at Yale University as her husband began his neuroscience career there. Mary Helen's position at Yale was first a Research Associate (1961–1973), then a Lecturer (1963–1973), and finally (1984) a tenured Professor.

In the 1960s, when corn and oat coleoptiles were the model systems, Mary Helen's research relied on ^{14}C-labeled IAA applied as a pulse to track auxin through tissues[3]. In the 1970s, Mary Helen's research began to feature microelectrode measurements of electric potential differences across membranes, because knowledge of these and other electrophysiological parameters was needed



to better understand auxin transport[4,5]. Mary Helen synthesized the field's and her results in an influential review article[6] that Bob Cleland (University of Washington) said was the paper that "brought the chemiosmotic hypothesis of PAT [polar auxin transport] to the attention of auxin researchers" (Figure 1). In this paper, Mary Helen clearly explained how protons pumps, pH gradients, the membrane potential, and polarly localized anionic auxin-permeable channels (not yet discovered) could form a mechanism that moves the hormone through plants from cell to cell. Mary Helen's careful measurements of auxin transport velocities provided the data needed to parameterize a model that produced an important result: in order for the entire tissue to display the measured degree of bias and speed of auxin transport, the downstream end of each cell in a file needs to be only about two-fold more permeable to the auxin anion than the opposite end. This paper[7], authored by Mary Helen, her husband, and her father (a renowned mathematician at the University of Maryland), should be read today by all researchers studying PIN and ABCB auxin transporters.

In the 1980s, more so than measuring polar transport through tissues, Mary Helen used radiotracer and electrophysiological methods to study auxin-related membrane physiology. She incorporated biochemical methods to investigate auxin uptake and the binding of pharmacological agents that impair transport,. Using plasma membrane vesicles and coleoptile sections[8,10,] she obtained electrophysiological support for the idea that auxin stimulated the plasma membrane proton pump[11,12], a key tenet of the acid growth hypothesis. When, in the 1990s, the patch clamp technique promised to revolutionize the study of plant membrane transport, Mary Helen brought this new technology into her lab[13]. At the same time, Arabidopsis was replacing traditional systems for studying almost everything. Using the patch clamp technique[14], Mary Helen embraced both developments and became among the first to characterize ion channels in Arabidopsis plasma membranes.

Throughout her career, Mary Helen served the American Society of Plant Physiologists as an elected member of the Executive Committee, a member of the Board

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of Trustees, a *Plant Physiology* editor, and a member of various committees. In 1990, Mary Helen was elected President of the society, only the second woman to hold the office.

The rigorous thinking and hard work needed to generate new knowledge in auxin transport physiology never diminished Mary Helen's love of nature. Instead, she nourished it in her job as the director of Yale's Marsh Botanical Garden, and she made it possible for countless Yale students to develop their own genuine connection with the living world by establishing the Environmental Studies program at Yale, which is now a complete undergraduate major. As of April 2022, Mary Helen is living with her husband Tim in Hamden, Connecticut, with plenty of reasons to feel satisfied.

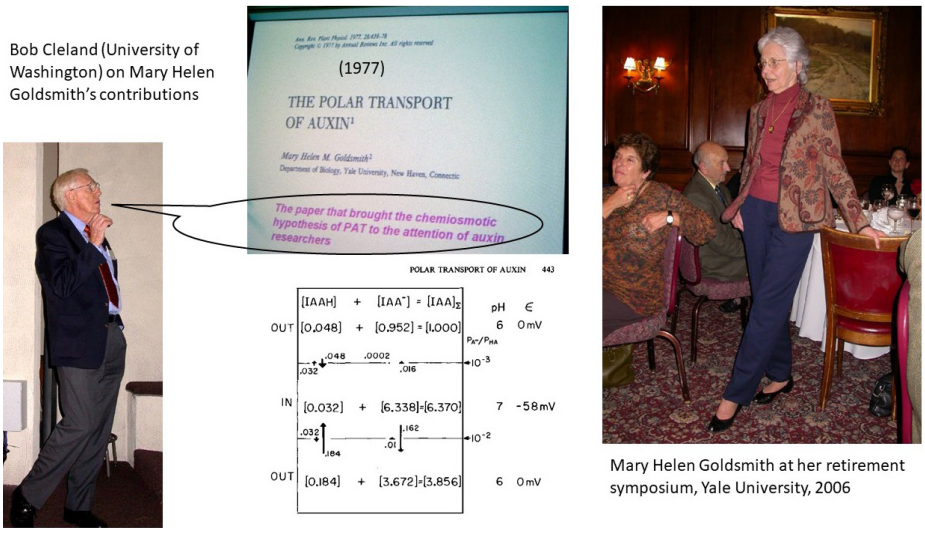

Figure 1. Bob Cleland (University of Washington) spoke about Mary Helen's career at her retirement symposium at Yale University in 2006.

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