



Emanuel Margoliash

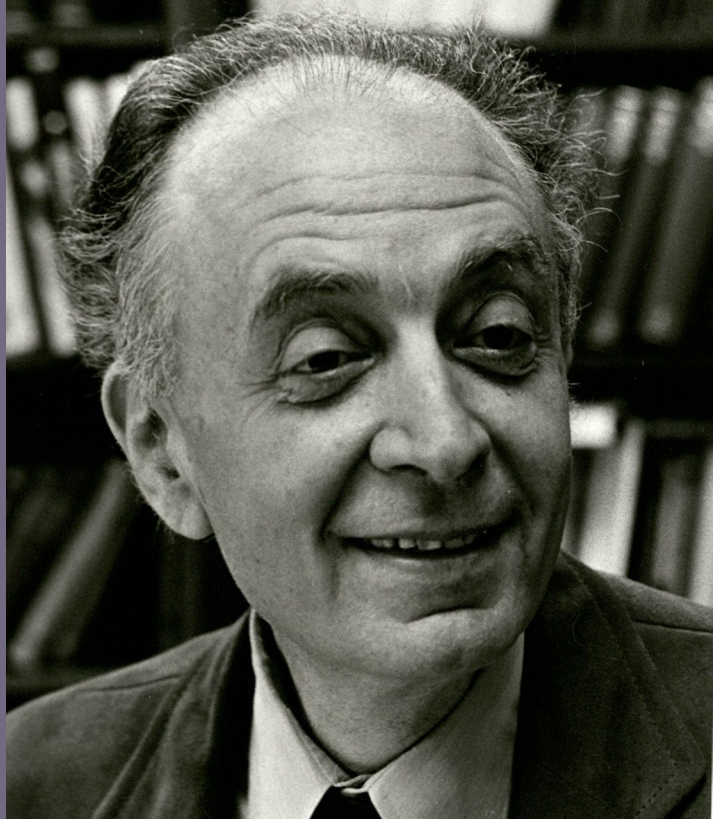
1920–2008

BIOGRAPHICAL

Memoirs

*A Biographical Memoir by
Indrani Mukharji*

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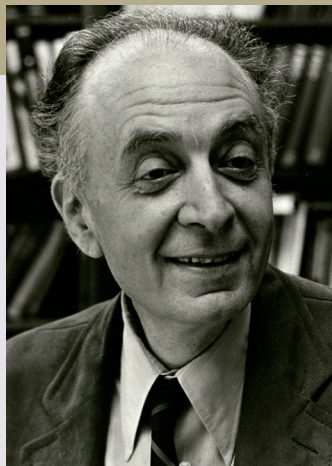
EMANUEL MARGOLIASH

February 10, 1920–April 10, 2008

Elected to the NAS, 1975

Emanuel Margoliash was a quintessential biochemist who dedicated his lifelong research to the heme protein Cytochrome *c*, having isolated, crystallized, and sequenced it from numerous prokaryotic and eukaryotic organisms. Cytochrome *c* is a highly conserved protein that is responsible for the transfer of electrons leading to oxidative phosphorylation and ATP synthesis. It is also involved in triggering programmed cell death through apoptosis. Margoliash's pioneering research led to pivotal insight into protein structure and function, mechanism of action, and evolution of the metabolic pathways relating to Cytochrome *c*.

A native of Cairo, Egypt, Margoliash earned a B.A. in 1940, an M.A. in 1942, and an M.D. in 1945, all from the American University of Beirut. After service as a medical officer in the Israeli Army in 1948, he began work at the Cancer Research Laboratories, Hebrew University-Hadassah Medical School, in Jerusalem. Focusing on Cytochrome *c*, he did research in Sweden, Utah, and Canada before becoming a research fellow at Abbott Laboratories. He left Abbott to take a senior faculty position at Northwestern University in 1971, staying until his retirement in 1990. He then joined the University of Illinois-Chicago, where he continued his research until his last days.



Photography by Ullis Saule

Emanuel Margoliash

By Indrani Mukharji

Emanuel Margoliash was born on February 10, 1920, in Cairo, Egypt, to Wolf and Bertha (Kotler) Margoliash. He earned his Bachelor of Arts degree in 1940, Master of Arts degree in 1942, and Doctor of Medicine in 1945, all from the American University of Beirut with high honors. He married Sima Beshkin on August 22, 1944, and they had two sons, Reuben and Daniel.

Margoliash served as a medical officer in the Israeli Army during the 1948 Israel War of Independence. He was in Jerusalem during its siege. After the war, he joined the Cancer Research Laboratories at the Hebrew University-Hadassah Medical School in Jerusalem

to begin an extraordinary scientific career spanning six decades. His intellectual curiosity and his incisive and analytical powers were evident throughout his career, and his passion for Cytochrome *c* research took him all over the world. Thus, Margoliash was engaged in research at the Nobel Institute Department of Biochemistry in Stockholm, the University of Utah College of Medicine, and the McGill-Montreal General Hospital Research Institute prior to becoming a Senior Research fellow at Abbott Laboratories in North Chicago, Illinois.

In 1966 Margoliash, then a senior scientist at Abbott Laboratories, was invited to give a seminar at University of Wisconsin. There, a chance meeting with Professor Walter Fitch launched a notable research collaboration that led to the construction of phylogenetic trees based on protein sequences. With 10 published amino acid sequences of Cytochrome *c* and 10 more yet unpublished sequences from Margoliash's lab, Fitch and Margoliash assembled a phylogenetic tree of 20 species that spanned yeast, insects, fish, birds, and mammals. The landmark 1967 *Science* paper, "Construction of Phylogenetic Trees,"¹ which has been cited more than 3000 times, was a significant breakthrough that led to the emergence of molecular phylogeny as a major field of study.

The Fitch-Margoliash methodology made it possible to construct branching diagrams, leading to better understanding of the relationships between widely varied species. Their collaboration continued for several years, as evidenced by a significant number of joint publications that delineated the terms, algorithms, statistical methods of wide applicability, and methodologies of this new field.²⁻⁸ Margoliash's contributions to the field of molecular evolution led to nearly 300 scientific publications. Some of the seminal articles on Cytochrome *c* are cited here.⁹⁻¹⁶

In 1971, Margoliash left Abbott Laboratories to join the faculty at Northwestern University in Evanston, Illinois, and continued his research on Cytochrome *c*. He was among a small group of senior faculty who led the founding of Northwestern's new Department of Biochemistry, Molecular Biology and Cell Biology in 1974. Margoliash served as the chair of the new department in 1980s and was appointed the first Owen L. Coon Professor of Molecular Biology.

He was a phenomenal teacher. An outstanding mentor to his graduate students and postdoctoral fellows, he not only helped them to develop their intellectual and analytical skills, but also taught them scientific demeanor and to be decent citizens. Margoliash mentored with the utmost care and wisdom a sizeable number of young scientists who were recruited in a short span of years. A great storyteller, he was captivating with his

many scientific travelogues. An interesting adventure involved an invitation from France in 1970 to dissect a coelacanth fish and isolate its Cytochrome *c* for sequencing. A rare anaerobic species, it had washed up on the shores of France and was deemed a national treasure by Charles DeGaulle, who would not allow the specimen to leave France. Therefore, Margoliash travelled to France to dissect and isolate its Cytochrome *c*, and returned with a sample of crystalline Cytochrome *c* from this rare species.

Margoliash displayed exceptional human qualities and was a kind, charming, yet unassuming and generous person-

ality. He retired from Northwestern University in 1990 and immediately after joined the University of Illinois at Chicago to continue his lifelong love of biochemical and molecular biology research. He remained active in research, collaborating with research groups at home and abroad, and published nearly two dozen more papers in the last decade of his life.

For his pioneering research, Margoliash was elected to the American Academy of Arts and Sciences in 1970, and to the U.S. National Academy of Sciences in 1975. He became a Guggenheim fellow in 1982 in the field of molecular and cellular biology. His broad talents, scholarship, and accomplishments were recognized with membership in the American Academy of Microbiology, the American Institute of Chemists, the New York Academy of Sciences, and the Illinois Academy of Sciences. He was a member of the American Chemical Society, the American Society of Microbiology, the Canadian Biochemical Society, the Society of Developmental Biology, the Biophysics Society (Executive Committee U.S. bioenergetics group 1980-1983), and the American Society of Biochemical Molecular Biology (Publications Committee 1973-1976). His other accolades include the 1970 Keilin Memorial Lecturer of the Biochemical Society, the Harvey Society Lecturer in 1970-1971, and American Society of Naturalists, Sigma Xi National Lecturer in 1972-1973, and 1974-1977.



Professor Margoliash working in his lab.
(Photography by Uldis Saule.)

Emanuel Margoliash, passed away on April 10, 2008, at the age of 88. He was preceded in death by his beloved wife Sima. A devoted husband, loving and caring father, he is survived by his two sons, Reuben and Daniel and grandchildren Jonathan and David.

“We all are richer for having known Emanuel, and poorer for his loss.”

Brian M. Hoffman April 14, 2008 | Evanston, IL.

“We lost a great scientist and marvelous teacher in Emanuel Margoliash.”

Willem Koppenol April 15, 2008 | Zürich.

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