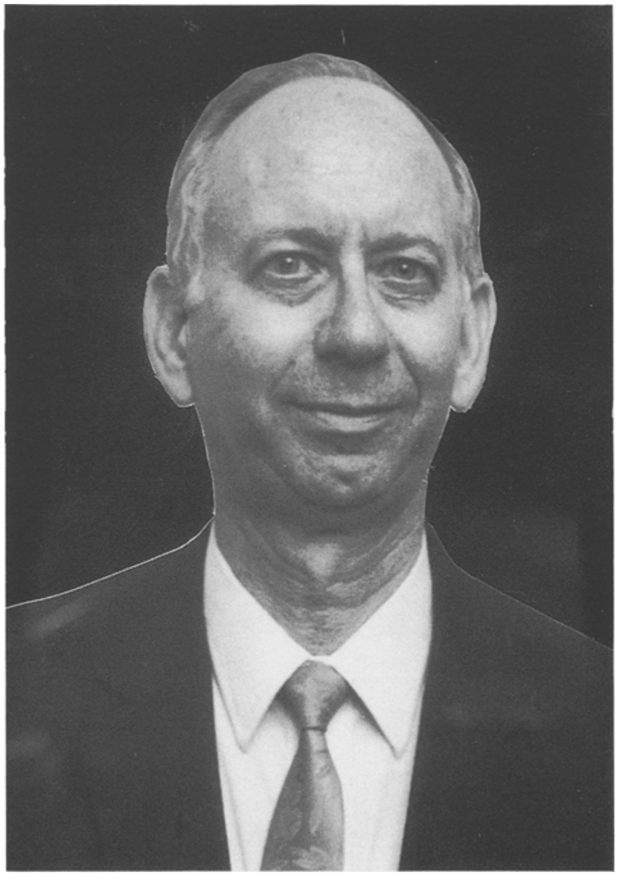

Mordhay Avron, 1931–1991

Mordhay Avron, born on September 29, 1931 in Tel-Aviv, died on March 29, 1991 after open heart surgery in Arizona. His sudden, untimely death came as a shock to his many students, colleagues, and friends. Mordhay's warm, optimistic approach to life, together with the successful experience in his first heart operation at the Mayo Clinic, led him to depart with the assurance that he will be away for just a few weeks. He left us at the peak of a distinguished career, in the middle of many unfinished projects and even more plans for the future. He is survived by his wife Nira, his son Boaz, and daughter Dana.

Mordhay's interest in plant sciences developed during Israel's War of Independence in 1948 when he was sent, together with his high school classmates, to help found a new kibbutz on the border between Israel, Jordan, and Syria. Eventually he became the person in charge of the banana plantations. Realizing the need for more professional knowledge, he decided to study agriculture, which he did at UCLA (1951–1955). He specialized in subtropical fruit trees, and his Ph.D. thesis dealt with oxidative phosphorylation by avocado mitochondria. From UCLA he went to the Johns Hopkins University to work as a post-doctoral fellow with Andre Jagendorf on electron transport in chloroplasts. Intrigued by Daniel Arnon's discovery of photophosphorylation in chloroplasts and the debate around it, Mordhay used his expertise from oxidative phosphorylation to establish conditions for photophosphorylation. He was thus the first scientist to confirm Arnon's discovery. This successful study was the beginning of a fruitful career in photosynthesis and bioenergetics.

In 1958 he returned to Israel to a research position at the Weizmann Institute of science in Rehovot, where he spent the rest of his professional career. Determined to continue his studies on photophosphorylation and coupled electron transport, he was astonished to discover that spinach, the worldwide experimental system for these studies, was not (and still is not) grown commercially in Israel. As he did not have any facilities for controlled plant growth, he chose swiss-chard as a substitute, and spent the first few months in Rehovot carrying out a very systematic study in which he established the optimal conditions for maximal rates of photophosphorylation in swiss-chard chloroplasts. The report of these studies, his first paper as an independent scientist (*Biochim. Biophys. Acta* **40**, 257–272, 1960), later nicknamed "the bible" in the lab, turned out to be applicable for many other plants. It was selected as a citation classic in 1978, and is still being referred to. It is a clear example of Mordhay's outstanding experimental ability and creative thinking, a combination that formed the basis for his successful career in science. Three years later he isolated from his swiss-chard chloroplasts a coupling factor for photophosphorylation later identified as the CF_1-ATPase section of the CF_0F_1 ATP Synthase.

Mordhay's interest in elucidating the mechanism of electron transport-coupled photophosphorylation led him to characterize the light-dependent and light-triggered ATPase and ATP–Pi exchange activities in chloroplasts, and to follow Andre Jagendorf's discovery of light-induced proton uptake, characterize it, and examine its relevance to energy coupling in photophosphorylation. These studies shifted his interest to the rapidly growing field of bioenergetics. Together with several collaborators he developed the concept and methodology of some of the most widely used methods for measuring the electrochemical proton gradient formed during electron transport. The article on determination of ΔpH by the distribution of [^{14}C]methylamine (*Eur. J. Biochem.* **25**, 54–63, 1972) was also selected as a citation classic. Using these methods, Mordhay and his coworkers established that in chloroplasts the H^+-to-ATP ratio is 3, and presented many of the decisive experiments that demonstrated the electrochemical proton gradient as the driving force for ATP synthesis in chloroplasts. They have also demonstrated ATP-driven reverse electron flow in chloroplasts and dissected it into two coupled processes: the ATP-induced formation of a proton gradient and the proton gradient-induced uphill movement of electrons, which later led to the demonstration of luminescence induced by reverse electron flow.

These achievements earned him worldwide recognition, and the stimulating, highly productive atmosphere around him attracted many students and visiting scientists from all over the world. Mordhay possessed a combination of intellectual curiosity, a fine sense of direction, outstanding experimental capability, and, above all, a talent to separate a complex problem into its most simple elements. These features also made him an excellent teacher. His group became the centre of photosynthesis and bioenergetics research in Israel, where many of the scientists working in these fields are his former students and collaborators.

While continuing his studies on bioenergetics, his interest turned to the unusual metabolism of the halotolerant alga *Dunaliella*, one of the few organisms shown to live in the Dead Sea. He studied in detail its specific mechanism of osmoregulation via glycerol production and its capacity to produce high concentrations of β-carotene, and became a pioneer in adapting these features to commercial use. It gave him tremendous satisfaction that he could utilize his basic research results in a beneficial applied research project.

Being an immensely respected scientist and administrator did not change his unique personal properties. Mordhay was a very modest, generous, and warm man, always ready to help his students, colleagues, and friends. His pragmatic, cheerful approach to life made all those around him feel good in his presence. This human side of Mordhay is the one we remember the best and miss so much. Those of us who were privileged to know him share the deep sense of loss at his untimely death.

Zippora Gromet-Elhanan
Weizmann Institute of Science
Rehovot, Israel