

Efraim Racker

June 28, 1913 — September 9, 1991

Efraim Racker came to Cornell in 1966 as Albert Einstein Professor (one of six awarded by the State of New York) and Chairman of the Section of Biochemistry in the newly created Division of Biological Sciences. He was a key figure in the expansion of the Section at that time, bringing with him eight younger colleagues as faculty members. His brilliant research, and concern for developing a strong graduate research program for the Section were instrumental in setting the pattern for the breadth and strength Biochemistry (now Biochemistry, Molecular and Cell Biology) enjoys today. An example of Ef's efforts to strengthen the biochemistry graduate program at Cornell led him to hold an evening seminar program in which each student spoke on his own research. For the first ten years, or so, Ef only occasionally allowed other faculty members to attend and he constantly interrupted the students with questions about the presentation or research. The seminars are still held, now with all faculty invited but the primary advisor not allowed to speak, and are known as the Racker Seminars.

Ef Racker was born in Neu Sandez, Poland, and grew up in Vienna. He had natural artistic talent, and almost went to Art School. Instead, he decided on Medical School for his advanced training, graduating in 1938. Biochemistry, brain function and art had become major interests, and remained so for the rest of his life. He escaped to England as the Nazis moved in, and began work on energy metabolism of the brain at the Cardiff Mental Hospital. In 1941 he moved to the United States. After short stays at the University of Minnesota, and Harlem Hospital in New York City, he worked for eight years (as Instructor, then Assistant Professor of Microbiology) at the NYU School of Medicine. There he pursued his interest in energy metabolism and made the seminal discovery of a thioester high energy intermediate, a bond previously unknown in biology. During a short period at the Yale University School of Medicine he discovered the enzyme, transketolase. For the next twelve years he was Chief of the Division of Nutrition and Physiology at the Public Health Research Institute of the City of New York. During that time he mounted large programs dealing with the nature of mitochondrial oxidative phosphorylation, and control of energy metabolism in cancer cells. He discovered the enzyme of mitochondria responsible for making ATP (called F₁), and isolated several of its functional subunits. After moving to Cornell he developed and refined methods for tearing apart the membranes that accomplish oxidative phosphorylation, then putting their pieces back together in small lipid vesicles to restore the original activity. This resolution and reconstitution approach to understand the function of membrane enzymes was one of the most important contributions of Efs career, opening up an enormous field of research for others to follow and revolutionizing the field of membrane biochemistry. Ef worked

at the lab bench throughout his career, and a particularly dramatic experiment he did himself was the incorporation of bacteriorhodopsin, a bacterial proton pump driven by light, together with ATP synthase from beef hearts to form a chemiosmotic chimera, which used energy of light absorbed by the bacteriorhodopsin to synthesize ATP on the beef heart enzyme. This work is often cited as the final evidence supporting the chemiosmotic theory of energy coupling. Later, he returned to the study of the biochemical basis of cancerous growth. He had long emphasized that ATPase is necessary for glycolysis and proposed that in many transformed cells the high glycolytic rate is caused by an aberrant ATPase that normally transports sodium and potassium ions. He was studying the probable role of protein kinases in such a pathway when he died.

During his career Ef published about 500 research papers. In 1965 he wrote an advanced text titled *Mechanism in Bioenergetics* and then wrote completely new texts in this area in 1976 and 1985. He received numerous honors, including the National Medal of Science, honorary degrees from the Universities of Chicago and Rochester, and was elected to the National Academy of Sciences in 1966. He was a prolific reviewer of grant applications, and a tremendous advocate for bright young scientists. He was concerned about public understanding of the importance of science, and in 1979 wrote a collection of essays in support of basic research titled *Science and the Cure of Diseases: Letters to Members of Congress*. He had a passion for hearing about new advances in science, and kept abreast of many areas. Ef admired good critical thinking, and was not very tolerant of that which he considered sloppy reasoning; he was known for almost always asking the first, and usually the most penetrating questions, at seminars that he attended. He had many students, postdoctoral associates and visiting scientists in his laboratory over the years; but never ceased to work at the bench himself (including the very last day, at the end of which he was overcome with a fatal stroke).

There were many other facets to Ef Racker's life, besides a total dedication to good science. He had a warm, supportive family life and was a wonderful husband, father and grandfather. With sterling help from his wife, Franziska Racker, their house was the site of ever flowing hospitality for lab members and visiting friends, most often other scientists. Ef and Francis both formed deep friendships with scientists and artists from all over the world. He had a rich sense of humor, and was a source for many stories. Ef enjoyed physical activity, and was an ardent (and competitive) tennis and squash player for as long as he was able. But above all Ef remained an artist. He would work late at the laboratory, come home, have dinner, and paint for the rest of the evening. He had several, usually Impressionist derived styles, and was amazingly prolific. Many paintings were sold in benefit sales, including the Edsall fund, a fund used for interest-free short term loans to graduate students and postdocs

in the Section. Many other paintings were gifts to departing students or visiting colleagues. Prior to a student's leaving, there was a small ceremony in which a choice had to be made between about 50 paintings available at that particular moment. There are Ef Racker paintings all over the world, in scientific institutions and in the homes of scientists. Together with the monumental scientific output, they will help keep his memory warm for all who knew him.

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