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OBITUARY

George Akoyunoglou, 1927–1986

George Akoyunoglou, our colleague whose recent untimely death shook the photosynthesis research community, was born on October 28, 1927, in Drama, a city of Macedonia, Northern Greece. The 2nd World War broke out when he was 12 years old. In 1946, one year after the end of the war, George enrolled in the chemistry section of the University of Thessaloniki, the second largest city in Greece and the capital of Northern Greece.

Those were difficult times for our country. A bitterly fought civil war broke out in 1946 and in three long years completed its destruction. In 1949, right after the end of the civil war, when he was in the 3rd year of his studies, he was called for army service. He spent three and a half years in the army, rising to the rank of a second lieutenant of the reserves. Later he was promoted to a higher rank. His specialty was War Materials, meaning ammunition, a traditional army career for chemistry graduates. George returned to the university in 1952 and obtained his Chemistry Diploma in 1954.

After a short time in the industry, he spent the next four years teaching chemistry in a middle level school (Commercial School) in his native Drama. In 1959, having earned a Greek Government scholarship, he enrolled as a graduate student in the University of California at Berkeley. Before departing to America, he married Joan Argyroudi. Working in Chemical Biodynamics Laboratory under Nobel Laureate Melvin Calvin he was, unavoidably, introduced to photosynthesis research. His doctoral dissertation treated two themes: unstable intermediates of the photosynthetic carboxylation reaction and the diazomethane reaction in aqueous solutions. During his Berkeley days, he spent some time also in the laboratories of G. Seaborg and I. Perlman. He earned a Ph.D. in Biorganic Chemistry from Berkeley in 1962.

George, then, worked one year (1962–1963) at the Ames Research Center of the National Aeronautics and Space Agency, at Moffet Field, California, under a National Academy of Sciences fellowship. His tasks were to study the effects of magnetic and electrostatic field on algae and on the enzyme ribulose biphosphate (RuBP) carboxylase, and to analyze meteorites for endogenous organic compounds.

In 1963 he returned to Greece with the first wave of Greek scientists recruited abroad for the Nuclear Research Center Demokritos. The early sixties were still a period of construction for young Demokritos, so what George found upon arrival were only a few major buildings and a number of makeshift buildings, or shacks as they are known. Biological laboratories were housed in those shacks, and there George and his wife Joan set about organizing the first photosynthesis research group in Greece, with the help of a $15,000 grant from the Charles F. Kettering Foundation. In a few years, however, the large building which now houses the Departments of Biology and Chemistry was completed and George moved his laboratory there. Incidentally, to fulfill the saying that in Greece nothing is more permanent than the temporary, those makeshift buildings are still around and in fact they have been recently returned to the Department of Biology after being vacated by the Department of Uranium Prospecting.

It was in the new building that we first met in 1969. I had returned to Greece from the University of Illinois, on his invitation to join his group, along with the second wave of repatriated Greek scientists. He was the head of the Department of Biology (a position he held longer than any other person) and I was its newest member.

Over the years of his career in Demokritos he sat also in various top level policy-setting councils influencing the course and the evolution of the Center. For a time he served also in the executive council of the Oceanographic and Fishing Institute (now the National Center of Sea Research). He held a membership in many national and international scientific societies: Hellenic Biochemical and Biophysical Society (founding member and for many years member of its executive council); Greek Chemical Society; Greek Biological Society; Greek Society of Nuclear Scientists; European Molecular Biology Organization; American Society of Plant Physiologists; American Society for Photobiology; Sigma Xi; Japanese Society of Plant Physiologists; and International Society of Chloroplast Development. He was the elected president of the last society when he passed away on August 1, 1986.

After his debut in photosynthesis research with his work on the carboxylation reaction in Berkeley, George continued on the same theme for some time in Greece. Then, during a visit to the laboratory of C. Sironval at the University of Liege, his interest took a turn to the direction of the development of the higher plant chloroplast. The stimulus was the discovery that the biosyntheses of chlorophyll *a* and chlorophyll *b* can be slowed down to different degrees by illuminating etiolated plant seedlings with millisecond light flashes. George adapted this idea by employing a photoperiod of 2 min light and 98 min dark-

ness to study not only chlorophyll biosynthesis, but also the development of the mature chloroplast from the etioplast.

He published extensively on the effects of seedling age and of light color on the development of the photosynthetic apparatus. Using various types of light treatments of etiolated leaves, he succeeded in modulating the characteristics of the photosynthetic membranes and he set out to study: the biosynthesis of chlorophylls; the stepwise formation and organization of the pigment–protein complexes into higher order structures; the formation, organization and cooperation of the photosynthetic units; and the formation, structure and composition of thylakoid membranes and their self-adhesion to grana stacks. He discovered that under intermittent illumination plants form agranal 'protochloroplasts' and synthesize selectively chlorophyll *a* and reaction center complexes but they need continuous exposure to light in order to assemble the light-harvesting units.

George's interests ranged from the physiology to the biophysics of photosynthesis. In the recent years, he became interested in the mechanisms which control the distribution and redistribution of excitation energy among the two photosystems and in the mechanisms which control the biosynthesis of thylakoid components. Interpreting his extensive results, he proposed a mechanism of post-translational regulation of the development and differentiation of the chloroplast that depends on the rate of chlorophyll formation.

George worked along with many personalities of the photosynthesis world. Foremost among them is his wife, Joan Argyroudi-Akoyunoglou whose name appears in most of his publications. Other noted scientists who coauthored published work with George Akoyunoglou include M. Calvin, H.W. Siegelman, C. Sironval, H. Grimme, S.W. Thorne, E.S. Canellakis, A. Melis, Y. Manetas, and H. Senger.

The 5th International Congress of Photosynthesis in Halkidiki, Greece, which George organized in 1980, is truly hard to forget. It was his largest organizational enterprise but not the only one. He was also the chief organizer of three international symposia on chloroplast development in Greece (Spetses 1978, Halkidiki 1980 and Rhodes 1985), of a symposium on the autonomy and biogenesis of mitochondria and chloroplasts (Delphi 1982) and a coorganizer of a symposium on the assembly of energy transducing membranes (Sydney, 1981) and of a special Federation of European Biochemical Societies (FEBS) meeting (Athens 1982).

If I were to use but one word to describe our late colleague, I would unhesitatingly choose the adjective 'wise'. George was truly a wise man in the first and true sense of the word. He displayed balanced judgement in matters concerning family, career, science, and department. He once told me that he liked to plan several moves ahead. He was a realist striving for the affordable, rather than for the desirable. Far from being a cool calculating man, however, he was a warm and sensitive person, very affectionate to his family, very warm to his friends, and very considerate to his adversaries. He will live as such in our memories.

George is survived by his wife and colleague in photosynthesis research Joan Argyroudi-Akoyunoglou and by his daughters Lily, Mitsi and Aleka. To all we express our heartfelt sympathy.

GEORGE C. PAPAGEORGIOU
Athens, Greece,
October, 1986