Jack E. Myers

1913–2006

BIOGRAPHICAL *Memoirs*

A Biographical Memoir by
Elisabeth Gantt

NATIONAL ACADEMY OF SCIENCES

JACK EDGARD **MYERS**

July 10, 1913–December 28, 2006

Elected to the NAS, 1975

By Elisabeth Gantt

Jack E. Myers was an outstanding scientist who performed important quantitative experiments on light utilization in photosynthesis by algae. He was also a well-respected educator, serving for many years as science editor of the highly regarded children's magazine *Highlights for Children.*

Jack was born on July 10, 1913 in Boyds Mills, PA at his mother's ancestral home in the farming country of eastern Pennsylvania. At the time of Jack's birth his father was a graduate student at Columbia University, as well as an instructor at the Brooklyn Training School for Teachers. Due to his father's enlistment in the US Army upon receiving his PhD, Jack's family moved often, but in summers Jack always returned to his birthplace. His closeness to the land is captured in his captivating 1996 autobiography "Country boy to scientist" (Myers 1996). He noted that "Summers in the hamlet of Boyds Mills were a marvelous experience from which I never completely recovered".

His interest in science was not sparked until an awakening in the ninth grade. He described himself, to that point, as a mediocre student. Jack credited his parents, who were child psychologists, with gently maneuvering him to attend Juniata College in Pennsylvania. Upon his graduation in 1934 with a degree in chemistry, instead of heading to medical school or an Ivy league school, he began his graduate work at Montana State College and served first as a research assistant, and later briefly on a college magazine. In 1936 he landed a teaching assistantship in the botany department at the University of Minnesota. His decision to go to Minnesota was greatly influenced by the fact that Evelyn DeTurck, who was to become his wife in 1937, was offered a partial assistantship in psychology. Scientifically his fortunes were enhanced by his work with George Burr a lipid biochemist whose talents and interests, like Jack's, ranged from the biochemistry of bacteria and plants, to thermodynamics.

By the late 1930s European scientists had made significant explorations in quantitative light measurements and photosynthetic organisms (Beijerinck 1890, Warburg 1923, Zscheile 1934, Kautsky 1937). Much of this work was required reading for graduate students at the time. Jack had a wide perspective on microbes and this led to an appreciation for the green microbes (unicellular algae) as highly suitable experimental organisms. Advancements making it possible to obtain useful chlorophyll measurements had been made, but Jack, being interested in the physiological aspects of biological processes, had set himself a greater challenge. His ambition for his Ph.D. project was not only to measure the evolution of O_2, but at the same time to also measure the fixation of CO_2 under normal conditions. Being resourceful, but with limited departmental funds, he rescued pieces of a Warburg apparatus, devised a recirculating system, and created a suitable illumination system from the lenses of an old slide projector (Myers 1996) thus creating a system for measurement under continued growth conditions. With his Ph.D. thesis (Myers and Burr 1940) he provided clear evidence that O_2 evolution, and CO_2 uptake were interdependent and highly dependent on light intensity. This process later became known as photorespiration, and the understanding of it was greatly expanded by many researchers in later years. His 1940 results were made possible by his development of an apparatus for continuous culturing of algae, the basics of which we use to the present time, of course with considerable modifications, many of which Jack created.

Myers' professional career

With a National Research Council Postdoctoral Fellowship in hand, Jack went in 1939 to Washington D.C. to join E. D. McAlister at the Division of Radiation and Organisms (renamed in 1965 as the Radiation Biology Laboratory) at the Smithsonian Institution. Jack and McAllister attempted to correlate the simultaneous induction kinetics of CO_2 uptake and fluorescence during the induction period in wheat and in *Chlorella* (McAlister and Myers 1940). They found greater complexity than they expected since the fast chlorophyll fluorescence emission rate was simpler than the more complex, multi-phase process of CO_2 uptake. The cavernous basement in the original brownstone Smithsonian building provided dark spaces, where plant light studies thrived under artificial light. The physical environment was little changed from when Jack was there (1939–1941), until 1966 when this author joined the laboratory. (Regrettably for the author, Jack Myers had moved on to Texas by the time she joined the Smithsonian. She first had the pleasure of meeting him in the mid-1960s on a visit to Austin, Texas.)

In 1941 Myers moved to Austin Texas, where he remained for the rest of his rich and productive scientific life. He was attracted by a job offer from E.J. Lund, an electrophysiologist, who was building a group of experimental biologists all of whom were using biophysical technical approaches. It was the perfect place for Jack who continued to develop the continuous culture system begun during his graduate work.

In the 1940s government funding for basic research was not as common as it became after the creation of the National Science Foundation (1950), and other federal grantmaking structures such as the Office of Naval Research, and the Atomic Energy Commission. Jack was successful in attracting research funding, allowing him to extend his basic studies, and to eventually build three continuous culture chambers. With his continuously improved turbidostat, the first being built and patented with L.B. Clark (Myers and Clark 1944), he had a reliable system for controlled studies with known cell densities and was thus able to quantitatively assess photosynthetic performance as a function of light intensity, gas ratios (CO_2 and O_2), and metabolic products, with regulated nitrogen and metal and mineral contents (Myers 1947, Myers 1951). His aim was to study organisms with clear participation of the functional photosynthetic unit. Thus, unicells such as some green algae (*Chlorella*, *Euglena*), and later cyanobacteria, like *Anacystis* and *Anabaena* were his selected choices. He continued to pursue making precise quantitative measurements and he and his students continued to select species and bring them into the laboratory devising chemically defined growth media and optimal growth conditions (Myers 1947, Myers et al.1951, Myers 1971, Myers and Kratz 1955, Myers 2002).

Collaborations with first-rate scientists, such as Stacey French, were always consonant with Jack's specific interests in digging more closely toward an understanding of how the photosynthetic apparatus worked. Stacey French was a postdoctoral fellow with James Franck at the University of Chicago, when in 1936 he went to seek out Jack at the University of Minnesota to learn more about the uptake of oxygen under high light in *Chlorella* which the Franck group had heard about. Jack and Stacey re-established contact after Stacey became director of the Carnegie laboratory in Palo Alto where investigations on algae had become a priority. In 1959, with a Guggenheim Fellowship, Jack spent a most productive time becoming familiar with oxygen electrode measurements. A life-long friendship with French resulted, and led to increased insights on chromatic transients from simultaneous recordings of action spectra (Myers and French 1960a, Myers and French 1960b) where the photosynthetic action was directly correlated with the absorption wavelengths, and where the contribution of chlorophyll b became very apparent.

The participation of additional pigments, i.e. 'accessory pigments' in photosynthesis had already been suggested by Engelmann, who had followed the aggregation of oxygen-loving bacteria around algae illuminated by various wavelengths (Engelmann 1883). However, not until the 1950s when Haxo and Blinks (1950) published extensive 'action spectra' of green and non-green algae were the roles of the 'accessory pigments' fully appreciated. These were further enhanced by Duysens' (1951) publication noting that energy from these pigments was clearly transferred to chlorophyll. In contrast to the rather narrowed light absorption by chlorophylls (a and b) the very abundant blue and red-colored pigments (phycobiliproteins) in cyanobacteria and red algae came to be recognized as major light absorbers which filled the gap left by chlorophyll.

Jack encouraged his students to think broadly and to take on important projects such as the elucidation of c-type cytochromes (Holton and Myers 1963) and, four years later when they were better understood, the functions and physical characteristics of cytochromes. (Holton and Myers 1967). Continuing questions and logical suggestions centered around the contribution(s), interactions, and regulations between two photosystems. Fluorescence measurements in *Chlorella* made in the Myers' laboratory (Bonaventura and Myers 1969) were overall consonant with those made by Murata (Murata 1969) with *Porphyridium* in suggesting that the two photosystems (I and II) were regulated by a mechanism that balances the distribution of excitation energy between them.

A consummate mentor and educator

Jack's high standards in research, together with his commitment to teaching were exhibited early in his career by his co-authoring a textbook on physical chemistry for premedical students (Matsen et al. 1949). He was a remarkable educator, noted not only for the time and attention he gave to his graduate students, but also for his classroom teaching. His former students continued to express their admiration for Jack in many ways, some of which are encapsulated in oral and written tributes (Brand et al. 2008). Jack was also highly regarded internationally, and one of his close associations was with A. Hattori's laboratory. Hattori encouraged his former student Yoshi Fujita to examine the metabolism of cyanobacteria in Jack's Laboratory with a cell-free system that they developed (Fujita and Myers 1965). This is another example of where contacts were initiated by common scientific interest, and strong friendships developed between the laboratories and continued and expanded to include other photobiologists (including this author). Yoshi Fujita always considered Jack Myers 'a teacher extraordinaire' (Murakami and Mimuro 2006).

His laboratory also freely shared its expertise and cell lines. One of the most valuable has been the single celled fresh-water cyanobacterium *Synechocystis elongatus* PCC 6301 (*Anacystis nidulans*, nee TX20) which was cloned in a chemically defined medium, and characterized the wild-type and selected mutants which many of us have found invaluable (Brand et al. 2008, Khanna et al. 1986, Sugita et al. 2007).

The high regard that Jack's students, and friends had for him, was reciprocal and likewise extended to people who worked with him in the laboratory. For over thirty years J.-R. Graham worked with him as a technical assistant, and Jack recognized her continued contributions, frequently listing her as a co-author over the many years of their association (Myers et al. 1951, 1983, Khanna et al. 1986).

During Jack's most highly productive years, it should be remembered that he was a fully committed parent. Jack and his wife Evelyn parented four of their own children, but upon the tragic death of his younger brother and wife, Jack and Evelyn adopted and raised the five children surviving from his brother's family.

His wide ranging additional educational contributions also included publications on life support in space. (Myers 1963). Yet, his most remarkable and most widely seen contributions were those as science editor (1958-2006) for *Highlights for Children*, which is to this day a most influential children's magazine, originally started by his parents. The topics he covered ranged widely, of which a small sample is included here (Myers 1982, 1991, 1993, 2001). Topics ranged widely, included human physiology, the disappearance of dinosaurs, and questions such as do cats really have nine lives, and do dogs come from wolves?

Recognition

Jack Myers was widely recognized and honored for his work in photosynthesis because of his ability to continuously produce and improve precise standards for physical measurements of photosynthetic processes under defined conditions. Some of his honors include a Guggenheim Fellowship (1950), the Darbaker Award (1959) from the Botanical Society of America, and service as President of the Phycological Society of America (1960). From Juanita College he was awarded a Doctor of Science (1966). In 1974 the American Society of Plant Physiologists awarded him both the Charles F. Kettering Award, and the Charles Reid Barnes Life Membership Award. His election to the National Academy of Sciences followed the next year (1975). A demonstration of the further breadth of appreciation was the Founders Award (1998) from the American Society of Gravitational and Space Biology.

In 1975 when he was elected to the NAS he was recognized for "insights fundamental to much of photosynthesis research over the past thirty years." Yet, Jack continued research well beyond those years, as noted by another special recognition at the 1993 Gordon Research Conference on the Biochemical Aspects of Photosynthesis where he was an honored speaker, and surrounded by many of his friends and admirers.

At left with his friend George Cheniae, at right flanked by admirers Douglas Bruce, John Biggins, and Beth Gantt

ACKNOWLEDGEMENTS

The author is especially grateful to Jerry J. Brand for sending her a boxful of reprints, which he had collected, and which along with selected comments from C.O. Patterson served for writing this memorial article. Thanks, are also due to Doug Bruce for input into the memoir, and to Doug and Beverley Green for input on the 1993 Gordon Research Conference on Photosynthesis. Likewise, thanks are due to Kaori Ohki for her remembrances of the interaction with Y. Fujita's laboratory, from which this author also benefited. Govindjee's kind help is likewise appreciated, as is that of the Highlights Foundation for supplying the portrait of Jack Myers.

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