Memorial to Elso Sterrenberg Barghoorn, Jr. 1915–1984

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Scientific interests were discreetly focused by Elso Barghoorn. He was a quiet but intense scientist and historian who imperceptibly guided students and colleagues into productive investigations. Although Elso will probably be most remembered for establishing the new discipline of Precambrian paleontology, his personal and collaborative contributions were multidisciplinary and spanned the stratigraphic record.

Elso was born on June 30, 1915, in New York City. He was an athlete as well as a scholar in his youth. He excelled as a sprinter and as a student in high school. He interrupted his education briefly to work as a deckhand on a Great Lakes freighter before completing his A.B. degree, with majors in botany and chemistry, at Miami University of Ohio in 1937. He entered graduate school at Harvard University the same year.

At Harvard, Elso carried out his research under the tutelage of I. W. Baily and W. H. "Cap" Weston. Of these mentors, Bailey apparently influenced Elso more. Elso's linking of the ontogenetic development to the phylogenetic specialization of rays in the xylem of dicotyledons was a brilliant extension of Bailey's contributions to a novel understanding of plant phylogeny. Barghoorn and Bailey shared interests in the basic principles of plant construction, fine structures of cells, and evolutionary patterns in plant tissues. Both enjoyed travel. They studied and gathered samples in many countries.

Elso obtained his M.A. degree in 1938 and his Ph.D. degree in 1941 from Harvard. During this period, he singly authored four articles, and he was the senior author of three dually authored papers. These publications dealt primarily with ray cells, but his graduate research included investigations of marine fungi and fossil pollens. The latter investigations significantly affected Elso's future.

From 1941 to 1943, Elso was an instructor of botany at Amherst College. In 1944 he became an assistant professor and was granted leave to serve as a field service consultant to the Office of Scientific Research and Development of the U.S. Army. This assignment was a consequence of his mycological training at Harvard, and it resulted in his being sent to Panama to investigate the fungal impairment of military equipment.

Upon his return from Panama in 1946, Elso accepted an appointment as an assistant professor in paleobotany at Harvard. Because he had recognized important fruit and seed floras in Brandon Lignite specimens that were contained in the collections of the "Natural History Cabinet" at Amherst, Elso decided to initiate an extensive investigation of this brown coal. He relocated the deposit in Vermont, and with his first two graduate assistants, he began a systematic study of the lignite. His first student, William Spackman, examined the woods, and his second student, Alfred Traverse, studied the pollens in the Brandon samples. Collectively their research significantly advanced the understanding of coal petrology and the development of palynology. Traverse's thesis clearly supports

Barghoorn's preference that pollen grains, when possible, should be assigned to living genera and families.

In the early 1950s, Elso's restless intellect led him to consider the vast, largely unexplored realms of the Precambrian. He admired the geologic investigations of the Gunflint Iron Formation in Michigan that were being performed by Stanley A. Tyler of the University of Wisconsin. With characteristic foresight, Elso realized the potential of concerted studies of this Precambrian depositional environment. He recognized that Tyler's stratigraphic interpretations after confirmation by rock ages, measured by modern dating methods, could negate the criticisms that had prevented acceptance of evidence previously presented for the existence of Precambrian life. In 1954 Tyler and Barghoorn published their discovery of fossils of microorganisms with complex morphologies in chert specimens from the Gunflint Formations. These specimens had a carefully determined age of 2 Ga. This discovery extended the time span of the records of life severalfold. Tyler and Barghoorn, with Barrett, also reported in 1957 the presence of an anthracitic coal in the Huronian Black Shale of Michigan. This coal, which approximates in age the Gunflint fossils, remains the oldest known coal.

Although Barghoorn apparently contemplated an expanded scientific assault on the Precambrian, he paid major attention to classical paleobotanical research. Between 1955 and 1964, the papers he coauthored with his students (R. A. Scott, M. W. Steeves, J. A. Wolfe, G. S. Bush, D. R. Whitehead, R. H. Eyde, and C. A. Kaye) dealt predominantly with phylogenetic and palynological investigations of Tertiary and Quaternary samples. During this period, Elso reviewed developments in microbiology and biogeochemistry and considered means of incorporating these rapidly evolving disciplines into his studies of the antiquity of life on Earth. He continued to attract outstanding students to his diversified research program. Elso became prepared to renew his attack on the Precambrian.

J. William Schopf was the first of Elso's graduate students to participate fully with him in Precambrian research. They studied rock specimens obtained from the Nonesuch (Michigan), Bitter Springs (Australia), and Figtree (South Africa) Formations as well as the Gunflint. Schopf accompanied Barghoorn and assisted him in the field investigations and collection of many of the specimens. Stanley Awramik, Andrew Knoll, and subsequently Paul Strother followed Schopf and added to the impetus he had given the program. This group observed a continuous increase in the number and diversity of the fossils of microorganisms in Precambrian rocks of various eras. Their findings moved back the time of the origin of life to approximately 3.5 Ga.

It was during the Nonesuch studies that I became involved with the Precambrian investigations at Harvard. Elso was aware of my conception that certain alkanes could be used as "molecular" or "chemical" fossils ("biological markers"). Typically, Elso sought to utilize all available means to gather information relating to the research problem at hand. He introduced me to Schopf and the Nonesuch studies. In retrospect, I do not recall that Elso ever asked me to work with him. He merely discussed the studies underway and evaluated my interests. It is pertinent to an understanding of Barghoorn to remember that he did not make requests or demands. He informed and listened.

Barghoorn's inquisitive mind was seldom dedicated solely to either a single discipline or research objective. As indicated above, he was heavily engaged in phylogenetic and palynological research before and during his Precambrian investigations, but these diverse endeavors did not satiate Elso's desire to increase his understanding of natural phenomena. He returned again with Bruce Tiffney to study the Brandon Lignite, and Elso and Richard Leo sought to determine the role of phenols in the silicification of fossils.

Barghoorn served as an advisor to the National Aeronautics and Space Administration. In this capacity, he assisted in the development of plans for the biological exploration of the solar system, and he conducted microscopic examinations of lunar samples.

Elso Barghoorn's earnest search for knowledge ended on Friday, January 27, 1984. He died peacefully in his sleep at the age of 68. He will be remembered for his many scientific accomplishments. The most important of these may be the consciousness of the values and pleasures of intelligent inquiry that he instilled in his students. The distinguished academic positions held by many of these students attest to the unique capability he possessed.

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Printed in U.S.A. 4/85