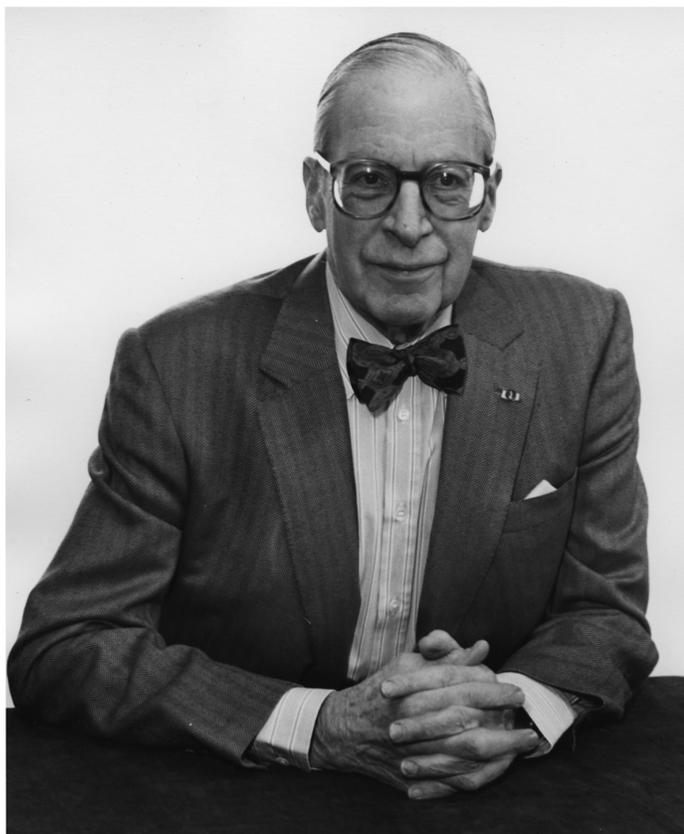




Arthur Kaskel Solomon



Arthur Kaskel Solomon was very much an exemplification of what his friend C. P. Snow called “the two cultures.” A pioneer in the establishment of biophysics at Harvard, in the United States and internationally, he was a major art collector, assembling a first-class collection extending from the early nineteenth century to the present. He knew many of the major figures of the day, both in science and art, and was a host to all in his splendid house on Craigie Street in Cambridge, a dwelling he had saved from destruction in the mid-1940s and which he always referred to fondly as “Craigie Street”.

Arthur was born on November 26, 1912, in Pittsburgh. His mother died when he was just six in the 1918 flu epidemic. He and his father moved to his aunt’s house, where he lived until he left Pittsburgh. He attended Shady Side Academy, a private boarding school. He slept there Monday through Thursday, returning to his aunt’s house for the weekend. From his maternal grandfather, Arthur Nattans, Arthur inherited a chain of drug

stores which gave him substantial financial security from an early age.

Arthur moved on to Princeton for his undergraduate years and there began his lifelong interests in science and art. He majored in chemistry, and initially at Princeton became deeply interested in theatre. Arthur joined the Theater Intime, a small theatrical group that included as its members Jose Ferrer and Joshua Logan. He also took up photography at Princeton, and that led to an introduction to Alfred Stieglitz and many long afternoons in New York discussing photography and art in Stieglitz’s gallery. It was through Stieglitz that Arthur bought his first paintings – Hopper and Burchfield watercolors. At Princeton, Arthur also became fascinated with radioactivity and wrote his thesis on it, correcting a small error in a paper written earlier by George Gamov on natural radioactivity. Radioactivity was to play a large role in Arthur’s first assignment as a faculty member at Harvard.

Graduating from Princeton in 1934, Arthur moved to the Harvard Chemistry Department for his graduate work, first with Oscar K. Rice and then with the physical chemist George Kistiakowsky. With both men,

*In tribute to their dedicated efforts to science and medicine, deceased members of the Harvard Faculty of Medicine (those at the rank of full or emeritus professor) receive a review of their life and contributions with a complete reflection, a **Memorial Minute**.*

Arthur learned how to make various kinds of scientific apparatus, and again this experience was to play a key role in the early days of the Biophysical Laboratory at Harvard that Arthur established. Arthur also expanded his art interests while a graduate student, auditing courses in art history, especially from Paul Sachs, Harvard's great Fogg Art Museum Director and connoisseur of drawings. As part of one of Sachs' courses, students traveled with him down the East Coast, visiting a number of important private art collections. Arthur always felt that this experience encouraged him to collect and live with art.

Arthur completed his Ph.D. in 1937, writing his thesis on the spectrum of deuterated benzene. In this same year, artificial radioactivity was discovered, and Arthur believed it was now possible to do things with radioactive isotopes not possible before. He applied to Lord Rutherford at the famed Cavendish Physics Laboratory in Cambridge, England, for postdoctoral training and was accepted. The Cavendish was building a cyclotron at that moment and the hope was that the resulting radioactive isotopes could be used for the study of chemical and biological reactions.

Unfortunately, the cyclotron was not completed when Arthur arrived in Cambridge, and Lord Rutherford died shortly after his arrival. Arthur joined the team assembling the cyclotron and gained valuable experience with that venture, but also became involved in building radioactivity detectors and scalars as well as measuring radioactivity, endeavors that again served him well in later years. Although he and his Cambridge colleagues never managed to carry out significant chemical or biological experiments while Arthur was in Cambridge, he did participate in a collaboration that produced radioactive cholesterol, one of the first biological tracer molecules produced and the subject of a *Nature* paper.

Arthur maintained his interest in art during those two postdoctoral years, writing a column on art for the Cambridge literary magazine *Granta*. He also did popular science writing on radioactivity for a magazine called *Discovery* edited by C. P. Snow, which led to their friendship. Five articles were written for *Discovery* that eventually were turned into the book *Why Smash Atoms* that was published by the Harvard University Press in 1940. A second edition was published in 1946, as was a revised edition in 1959. Eventually, translations in Spanish, German and Polish were produced. One of Arthur's closest friends in Cambridge was Arthur Schlesinger, Jr., and during that Cambridge stay Arthur met the sculptor, Henry Moore, with whom he developed a firm and long-lasting friendship.

Arthur returned to the United States in August of 1939, just before the war broke out, to George Kistiakowsky's laboratory for a second postdoctoral fellowship. The project he became involved with originated with James Conant, President of Harvard, an organic chemist who was interested in the *in vivo* synthesis of glucose. Conant had enlisted the help of the biochemist A. Baird Hastings at the Harvard Medical School who, in turn, approached Kistiakowsky to help make the radioactive precursors for the experiments and to measure the radioactive products. Kistiakowsky assigned the job to Arthur, and the assembled team soon showed that glucose is synthesized in the body from bicarbonate, a considerable surprise at the time (and contrary to Conant's idea that glucose is synthesized *in vivo* from two lactic acid molecules). As a result of that collaboration, Arthur became fast friends with Baird Hastings, and this friendship was instrumental in Arthur's career at the Harvard Medical School.

Arthur, like most scientists at Harvard and elsewhere, was soon involved in war-related research, and his group was assigned the task of evaluating the permeability of the skin to poisonous gases. It was a joint project between the Medical School and Chemistry Department, and involved measurements of the passage of radioactive gases through the skin of pigs. Soon feeling this research was too distantly related to the war effort, Arthur volunteered to go to England to work with his former Cavendish

colleagues on radar. He remained in England for four years until 1945. Initially, he worked on aircraft-tracking radar systems, but then was transferred to the British navy to help design naval radar. Arthur's substantial contributions to this work earned him thanks and honors from the British government and king, but he always insisted that it was something he and his colleagues had done together. It was at this time that Arthur met and became firm friends with Alan Hodgkin, Andrew Huxley and Richard Keynes, three English neurophysiologists who unraveled the nature of the nerve action potential. Hodgkin and Huxley went on to win the Nobel Prize, both to become presidents of the Royal Society and Masters of Trinity College, Cambridge. During this time in England, Arthur married Jean Roth, an American woman he met in 1938. He was then in Bermuda on an enforced vacation because of an elevated white blood count thought to be due to radiation exposure. When Arthur went to England in 1941, Jean came too, with the American Red Cross. They were married in 1944.

Arthur returned to the US in January of 1945, and temporarily joined the Radiation Laboratory at MIT, mainly doing public relations, explaining radar to journalists and others. He met Gerald Piel and Dennis Flannigan at that time, became friends with them and was an initial investor in *Scientific American*, the magazine they founded a few years later. An administrative position followed for a year with the American Cancer Society, arranged by Baird Hastings who was anxious that Arthur come to the Harvard Medical School to spearhead an effort on radioactive tracers. An appointment for Arthur as Assistant Professor of Physiological Chemistry came through as of July 1, 1946, and he was given the assignment of heading what was to become The Biophysical Laboratory on the ground floor of Building D of the Harvard Medical School quadrangle. The main role of the Biophysical Laboratory in the early days was to distribute and sometimes purify radioactive materials, build and maintain radioactivity counters and scalers, and even, for a while, to count radioactivity in samples provided by Harvard Medical School faculty. Among the other tasks assigned to the Biophysical Laboratory was to develop guidelines on permissible amounts of radioactivity to be given to subjects or patients.

Whereas Arthur collaborated with many Harvard faculty members during the early years of the Biophysical Laboratory, he did not have his own specific research problem. But as the laboratory matured and much of the instrumentation the laboratory made became commercially available, it was time for Arthur to find his own niche. After careful consideration, he chose to focus on quantitative ion flux measurements, initially across the red cell membrane. This line of research began in 1950 on the permeability of the red cell membrane to sodium and potassium and ended in the mid-1990s with a paper on urea and small amide permeability through the red cell membrane.

However, Arthur's studies on the quantitative transport of ions and other substances across membranes using radioactive tracers soon extended beyond the red cell to the kidney, gastrointestinal epithelium and other systems, including the alga *Nitella* with its giant cells. An especially important advance spearheaded by Arthur was the revival and extension of kidney micropuncture techniques, previously developed by A. N. Richards. Arthur and his colleagues adapted these techniques so that they could examine, using radioactive tracers, how kidney tubules modify the composition of artificial solutions. Previously these techniques allowed only the withdrawal and examination of natural samples from the kidney.

The Biophysical Laboratory became a lively place, attracting distinguished investigators from around the world. In the decade from 1955 to 1965, for example, those working at the Laboratory included Peter Curran, Jared Diamond, Charles Paganelli, Stanley Schultz, Erich Windhager, Guillermo Wuhittenbury and, as a visitor, Aaron Katchalsky, brother of the president of Israel. Investigators from

Venezuela were especially numerous over the years, and Arthur was recognized by the Government of Venezuela with the Order of Andres Bello in the 1970s.

An important and impressive feature of Arthur's research was its quantitation. He also was one of the first to recognize that water passes through the membrane via specific pores or channels, and he devoted considerable effort to characterizing these channels. The Nobel Prize in 2003 was awarded to Peter Agre, who isolated the water channels, now called aquaporins, and determined how they are selective for water molecules. Arthur and his colleagues also studied the active transport of substances across membranes, and over the years made many important contributions to the field. His studies with Peter Curran in the later 1950s on the coupling of water and Na⁺ transport in the intestine are viewed as key in the development of rehydration therapy for cholera. Arthur was appointed Professor of Biophysics in 1968.

In addition to establishing the Biophysical Laboratory at Harvard, Arthur played key roles in the establishment of the US Biophysical Society and the International Union of Pure and Applied Biophysics. Arthur was concerned that biophysics might become mainly radiation research especially in Europe, and thus from the start of both of these organizations he worked to involve distinguished investigators outside of radiation research. He played a particularly important role in the founding of the International Biophysics Union, serving first on its Steering and Constitution Committee and then as its Secretary-General for eleven years, from 1961 to 1972. The Biophysics Society was incorporated in 1957; the International Union in 1961. In the 1950s, Arthur had traveled to England and Europe to discuss biophysics as a discipline with many of the leading scientists of the day, including many he had met during his years in England such as Hodgkin, Huxley, and Keynes. This trip helped set the stage for the establishment of the International Union.

At Harvard in the late 1950s, Arthur pushed hard for the establishment of a graduate program in Biophysics. Although it was to be based in the Medical School, he wanted the program to be an across-campus program, the first of its kind at Harvard, involving members of the Faculty of Arts and Sciences as well as the Medical School. The program began in 1959, and despite vigorous opposition from unconvinced colleagues, became a tremendous success. When exasperated by the skepticism of some, he would quietly quote what the English mathematician, G. H. Hardy, said on an occasion at Harvard when referring to obstructionist and tiresome people, "Well, I have done one thing you could never have done," and that, of course, was to have established a distinguished biophysics program at Harvard. All of us associated with the program can testify to the accuracy of that. Arthur ran the program from its inception in 1959 until 1980.

The other important avocation of Arthur's, collecting art, also flourished over the years. While a postdoctoral fellow in Cambridge he met Justin Thannhauser, son of a famous German art dealer and himself a well-known dealer, through Justin's son, Heinz, an undergraduate at Cambridge. The family had fled the Nazis and had settled in Paris. Arthur spent vacations in Paris, often with the Thannhausers. Justin Thannhauser specialized in nineteenth- and twentieth-century art and was a friend of Picasso, to whom Arthur was introduced. It was from Thannhauser that Arthur bought his first important picture, a Van Gogh drawing. By the time Arthur left England in 1939, he had purchased six or seven other pictures, including a large Picasso portrait of Fernande Olivier, painted in 1906. While Arthur was in England during the war, his paintings resided at the Fogg Art Museum, the Picasso portrait in an honored place behind Paul Sachs' desk. This portrait plus two other important pieces are now in the Museum of Fine Arts in Boston; the rest of the collection will reside in the Fogg Art Museum.

During the war, Arthur's collecting involved the decorative arts, but following the war, he resumed his friendship with Thannhauser, who had relocated to New York. Arthur was soon again purchasing important pieces, including a Cézanne watercolor, a self-portrait by Monet, a Matisse, and a Toulouse-Lautrec. Over the years, Arthur added many other pictures to his collection, both from Justin Thannhauser and other dealers. His collection expanded, going back in time to include pictures by Delacroix, Corot, Courbet and Géricault. He also began to buy sculpture, including pieces by Rodin, Degas, and Lehmbruck.

By the 1970s, collecting art from the nineteenth and early twentieth centuries had become very expensive, and so Arthur and his wife, Marny, began to collect contemporary art. They converted the barn in back of Craigie Street into a small gallery and filled it with important pieces by Noland, Olitski, Bush and many others. Some sculpture is there as well, including pieces by Henry Moore and Michael Steiner. Another new collecting venture included Old Master prints introduced to him by Marny and Majorie Cohn, Curator of Prints at the Fogg Art Museum.

Arthur formally retired from the Medical School in 1983, but he maintained an active laboratory until the mid-1990s. He participated in the Biophysics Graduate Program until just a few years before his death, which occurred on November 6, 2002, during his 90th year.

Respectfully submitted,

John E. Dowling, *Chairperson*

Jared Diamond

James M. Hogle

Eugene P. Kennedy

Mariot Fraser Solomon