I look forward to my post graduate years in the hope that they will expand
my surgical training and proficiency, so that I might be able to make some
small contribution in a career of teaching, practice and research in surgery.
— M. Judah Folkman, 1956

WITH THESE WORDS M. Judah Folkman ended his autobiographical sketch for his application for surgical training at Massachusetts General Hospital, which was to begin
July 1957. Dr. Folkman’s remarkable journey through surgery and science ended suddenly with his passing on 14 January 2008 at the age of seventy-four. His life was blessed with a loving family, the love of his life, Paula, and creativity and controversy ultimately impacting the health of millions.

Moses Judah Folkman was born in Cleveland, Ohio, on 24 February 1933. His father was a rabbi. The family moved in 1947 to Columbus, Ohio, where he became responsible for a much larger congregation. Here Folkman changed his mind and heart from becoming a rabbi to becoming a physician. His family joked, “Either you will have to be a rabbi-like doctor or a doctor-like rabbi.” As he progressed through his professional life, his profound empathy for patients and families and his unique ability to comfort them were an attestation to his clergy-like qualities. Dr. Folkman graduated cum laude from Ohio State University in 1953. During his undergraduate years, he worked in the University Hospital surgical laboratory of Robert M. Zolliger, M.D., the chairman of surgery. It was there that the young Folkman learned the craft of surgery in animals and the design of surgical experiments. It was also the experience that led to his decision to become an academic surgeon. He then came to Harvard Medical School and graduated in 1957, magna cum laude. Surgical training followed under Edward D. Churchill and Paul S. Russell at Massachusetts General Hospital, and he became chief of the West Surgical Service in 1964–65. His training had been interrupted by a call to the U.S. Navy in 1960. This two-year stint at the National Naval Medical Center in Bethesda, Maryland, changed the course of his career and his intellectual focus. While working on the problem of long-term storage of blood substitutes on aircraft carriers, he, along with Fred Becker, decided to test the substitutes in an organ culture chamber adapted from the work of Alexis Carrel and Charles Lindbergh and described in their 1938 book, The Culture of Organs. He chose the thyroid gland and perfused the tissue through its vascular supply. After the system had been tested, Folkman wondered whether it might support the growth of tissue, and chose cancer cells. The observation was remarkable. The cells would engraft and form tumors, but the tumors would always stop growing when they reached about one millimeter in
diameter. Microscopic analysis held the answer: There were no blood vessels in the tumors growing in the chambers, whereas, in contrast, there were large networks of blood vessels in the same type of tumors implanted in animals. This observation, swirling in the mind of a creative scientific genius like Judah Folkman, led to the hypothesis that control of blood vessel growth into rapidly expanding cancerous tumors could be a control point for cancer therapy. With this observation permanently engrafted into his mind and soul, he returned to Boston, completed his training, and joined the surgical staff at Boston City Hospital. From there, he was called to succeed Robert E. Gross as surgeon-in-chief at Harvard Medical School and Children’s Hospital. He was thirty-four years old and had no formal training in the new specialty of pediatric surgery. He prepared for the position by spending six months under the tutelage of C. Everett Koop at Children’s Hospital of Philadelphia.

Dr. Folkman held this position for fourteen years at Children’s Hospital Boston. In that time, he formulated and tested his ideas on tumor angiogenesis and its inhibition. He devoted many hours to patient care and the operating room. In addition, he taught surgical residents, medical students, and nurses. His teaching abilities were legendary, his message inspirational, and his love of teaching infectious.

He stepped down as chief in 1981 to devote his full energies to his work in angiogenesis and the field he founded. His charismatic energy spurred young minds to join in solving the scientific problems, and scientific paper after paper became seminal for the field. Along the way, his style also provoked harsh criticism and animosity, which plagued him throughout his career.

However, the process of science has a funny way of uncovering nature’s secrets, and here, too, nature weighed in to support Dr. Folkman’s intuition. The byproducts now include anti-angiogenic approaches to many human tumors, macular degeneration, diabetic retinopathy, and other human diseases affecting millions.

This brief memoir can mention only the most broad and important aspects of such a productive career. As an example, the entire field of controlled release of drugs is based on a Folkman patent of anesthetic gases released through silicone rubber, again from his time at the Naval Research Center. Dr. Folkman, along with another colleague, Dr. David Long, had observed that certain dyes being used in experiments were staining the silicone rubber tubing in their experimental apparatus. Further testing showed that the dyes staining the tubing were oil soluble and actually migrated through the walls of the tubing. Realizing that this might be a way to deliver drugs locally over time, they designed new experiments that confirmed the possibility. This simple observation helped
create a new industry and a pioneering product, the long-term contraceptive “Norplant.”

When I asked him for career advice as a young person, he responded, “If you are going to spend your life working on something, you might as well pick something important.” Judah Folkman picked something important, and his work will impact the human condition. He indeed fulfilled his modest, understated goal, “to make some small contribution in a career of teaching, practice and research in surgery.”

Elected 1999

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