

MEMORIAL RESOLUTION

WILLIAM B. SHOCKLEY (1910 – 1989)

William B. Shockley, Alexander M. Poniatoff Professor of Engineering Science, Emeritus, died at his campus home on August 12, 1989, of prostatic cancer.

William Shockley was born in London on February 13, 1910, of American parents. Much of his pre-university life was spent in Palo Alto. He attended California Institute of Technology, receiving a Bachelor of Science degree in 1932. He carried out doctoral study at the Massachusetts Institute of Technology, obtaining the Ph.D. in Physics in 1936. As a graduate student he was amongst those who created the field of solid-state physics, the area where most of future his contributions would lie. He went directly from MIT to the Bell Telephone Laboratories where a major program addressed to understanding the physics of the solid state was just under way. World War II interrupted the scientific attack on understanding solid-state phenomena, but at the end of the war, the subject was resumed with added intensity.

The Bell Laboratories research environment was specifically suited to the problem being addressed. Every new material, or phenomenon, or device proposed was subjected to intense effort directed toward its understanding. A team of gifted, imaginative people from a number of different fields worked together in this place to establish a basis of physical understanding which would enable a new generation of technology. That effort literally would change the way technology serves mankind. Bill Shockley was at his best in this kind of environment. He proposed a field-effect transistor, which was constructed by colleagues. The first experimental model didn't work for reasons clarified by John Bardeen, who thereby opened understanding of the physics of semiconductor surfaces. Shockley received the Nobel Prize in 1956 jointly with Bardeen and Walter Brattain for their conception and development of the transistor.

The first working transistor, a point-contact device, was discovered while the phenomena underlying its operation were, at best, only partially understood. Meanwhile, Shockley conceived the junction transistor, working out a theory of its operation far in advance of a physical device under construction. Single-mindedness, intensity of effort and tremendous competitiveness characterized his participation in this and every other endeavor that he undertook. Remarkable results came from the group, and the role played by Shockley was broadly understood and appreciated by his contemporaries. Bill Shockley was never a comfortable man with whom to work. He set extraordinarily high standards for everyone, including himself, and virtually every activity was an all-out race in which he was an intense competitor. What came out of that creative ferment was the birth of the transistor at Bell Laboratories that had no precedent in kind. It is remarkable that forty years later, today's newest devices still have their origins in concepts Shockley developed in that creative environment. Other instances of this kind of creative activity are rare.

Shockley's decision to set up a new semiconductor activity in the Stanford area came in 1956. Perhaps the most long-range success of this venture was his recruitment of an outstanding set of people. They were attracted by Shockley, a person recognized as unique by his peers.

Robert Noyce, Gordon Moore, and Jean Hoerni were among them. After a short time, eight of these colleagues left to start Fairchild Semiconductor which became the most important source of new ideas in this area, including the planar process (Hoerni) and the invention of the monolithic integrated circuit (Noyce). In retrospect, it is clear that the kind of intellectual leadership Bill Shockley so brilliantly exercised at the Bell Laboratories did not directly translate into business management success.

In 1963, William Shockley was named the Alexander M. Poniatoff Professor of Engineering Science at Stanford. He came here as the solid-state electronics program had achieved some success and was developing rapidly. His participation in the program was principally in interaction with doctoral students working on their dissertations. He developed close ties with several of these students and added a strong component to the environment from which the strongest and most independent students found great benefit.

In the late sixties, William Shockley became concerned about correlations he perceived among race, intellectual performance and social performance. He devoted tremendous effort for the remainder of his life to what he saw as associated problems. These efforts came at a time and in a manner that stimulated great controversy. The University community was just beginning to participate in affirmative actions aimed to bring opportunity to the minority sectors that had earlier been denied opportunity.

Though freedom of inquiry was continually extended to William Shockley by the University, his studies were very unpopular. Nonetheless, he documented his work extensively and precisely, just as he had done with physical phenomena, and he left this body of data for further scrutiny by others in the future.

Throughout the time William Shockley had been at Stanford, his wife, Emmy, had been his constant colleague and supporter. Throughout his emeritus years, she had maintained his University office, worked with him on his projects, and had been his primary interface to the University and the outside community.

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