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Distinguished Lectureship Award on the Applications of Physics: Illuminating My Career From Flash Gordon to Laser Surgery

JAMES WYNNE, IBM T J Watson Res Ctr

As a child, I was fascinated by television programs about Flash Gordon. His partner in conquering the universe was Dr. Alexis Zarkov, a physicist, who had invented, among other things, a death ray gun. My personal "death ray" was a magnifying glass, focusing sunlight on unsuspecting insects, like crawling ants. I also practiced sneaking up on resting, flying, stinging insects and burning their wings before they could take off and attack me. So I understood something about the power of sunlight. In my senior year of high school, I had a fabulous physics teacher, Lewis E. Love, and I knew after one week that I wanted to be a physicist, not a medical doctor, which is the career my parents wanted me to pursue. It turns out that the first laser functioned on May 16, 1960, just one month before I graduated from high school, and it was inevitable that I would pursue a career working with lasers. My first job as a physicist, during the summer of 1963, was working with lasers at TRG, Inc. a small company whose guru was Gordon Gould, now recognized as the inventor of the laser. After three summers at TRG, I spent three years working on nonlinear optics for my PhD thesis, under the guidance of Prof. Nicolaas Bloembergen, who later won the Nobel Prize in Physics for codifying nonlinear optics. Following completion of my PhD research in 1969, I joined IBM Research, where I have worked ever since. Upon joining the Quantum Electronics group in the Physical Sciences Dept. of the T.J. Watson Research Center, my management told me to "do something great" with lasers. After working on atomic spectroscopy with dye lasers through the 1970s, I had the inspiration to acquire an excimer laser for the Laser Physics and Chemistry group. Using this laser, my colleagues and I discovered excimer laser surgery, capable of removing human and animal tissue with great precision, while leaving the underlying and adjacent tissue free of collateral damage. This discovery laid the foundation for the laser refractive surgical procedures of PRK and LASIK, which have been used to improve the visual acuity of nearly 30 million people. Today, I am working on validating my concept that the argon fluoride excimer laser can serve as a "smart scalpel," capable of debriding necrotic lesions of the skin without damaging the underlying and adjacent viable tissue, leading to faster healing, reduced pain, reduced probability of infection, and minimal scarring. To quote Louis Pasteur, "Chance favors the prepared mind!"