

Jim Breckinridge: the first 60 years in optics

James B. Breckinridge, SPIE President 1994

INTRODUCTION

This paper describes (1) how I became interested in optics and astronomy, (2) the enabling role of SPIE in my career, and (3) a summary of the exciting work we are now doing to develop technologies that will enable the direct detection of exo-solar system terrestrial planets. Each SPIE president comes from a different background. The road I took may be of interest to some.

EARLY YEARS

At the age of 8 years, I knew that I wanted to be an engineer. By the time I was 12, I had decided on astronomy and astronomical instruments. By the end of high school, I had built my own astronomical telescope and used it, along with a 3-inch Unitron refractor, to make over 4,000 visual observations of the brightness variable stars for the American Association of Variable Star Observers (AAVSO).

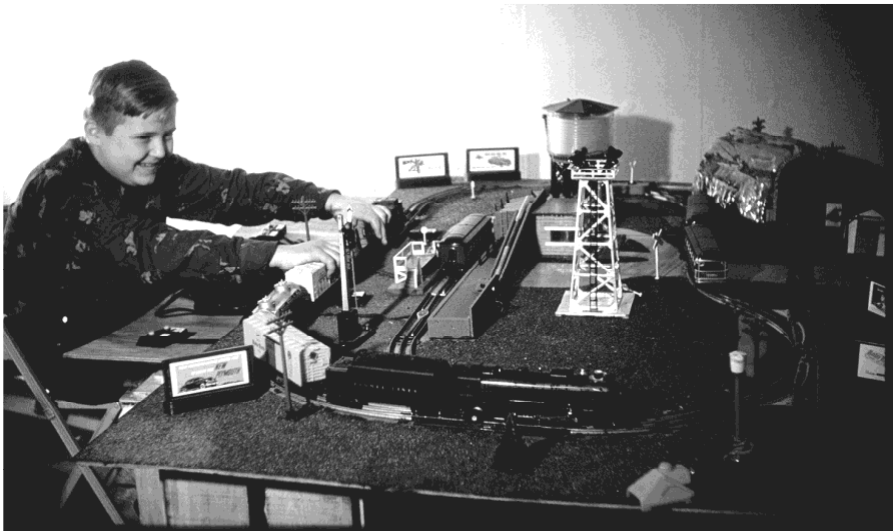


Figure 1. Jim Breckinridge is shown at the age of 8 (in 1947) applying hands on experimental-engineering of a Lionel Train set.



Figure 2. Jim Breckinridge with telescope in Cleveland, Ohio. By the age of 12 I knew I wanted to be both an optical engineer and an astronomer.

COLLEGE & WORK

From 1957 to 1961 I attended Case Western University and earned a B.Sc. in physics. After undergraduate school I went to work as an observing assistant or apprentice at Lick Observatory for three years. During this time I lived on the top of Mount Hamilton, with all the other astronomers, observing assistants and staff. I divided my time between work for Tom Kinman and Gerry Kron. With Gerry Kron I divided my time evenly between six-color photoelectric photometry and the design, construction, and application of an electronographic camera to photometric studies. Several of the astronomers encouraged me to publish my scientific results, and I authored five papers that passed peer-review and were published, the first in 1963.

In the spring of 1964, my three-year appointment was up and I accepted a job at Kitt Peak National Observatory working in the Solar Division for Keith Pierce. My first assignment was to use the 13.6-m Czerny-Turner spectrograph at the McMath Solar Telescope to make the first map (photographic) of the emission spectrum of the solar corona.

In the fall of 1965 I wanted to try out a career in industry, so Ann (my wife) and I traveled to Chicago, where I worked for nine months designing and building image intensifier and image converter tubes at Rauland Corporation, largely for the Night Vision Laboratory at Ft. Belvoir. My job was electron optical design using two testbeds designed for that purpose. I applied the photocathode processing techniques that I learned from Gerry Kron at Lick Observatory to make photo-cathodes for imaging systems. But I wanted to return to graduate school in Tucson.

In 1967, I returned to Tucson to work in the Solar Division. Soon I built a high-powered (very bright) Thorium hollow cathode tube and began working on a

wavelength atlas of the solar spectrum, which took five years to complete and prepare for publication. Today this atlas is the standard in the field.

I was admitted to the Steward Observatory of the University of Arizona. Before I started my graduate studies in astronomy, I realized that my future lay in the development and application of optical instruments for astronomy. In the meantime, Aden Meinel and his excellent faculty started up the Optical Sciences Center and I was attracted to attend graduate school there, because I really wanted to learn more about optical and infrared instruments for scientific measurements. I still believe that measurement and interpretation is the most exciting part of science. It was eight years after I had completed my undergraduate engineering education when that I entered graduate school at the Optical Sciences Center.

THE SPIE

My first two SPIE meetings were in San Diego for the Annual Meeting. The next meeting was on the subject of telescopes in astronomy, and it was held in Tucson, Arizona, in approximately 1974. My first paper in *Optical Engineering* was in 1978.

By 1982, NASA was recognizing the importance of optical systems to the science mission of the agency and I was asked by the director of Jet Propulsion Lab. to establish a center of excellence in optics there. So I became very active in both the Optical Society of America and the Society for Photo-optical Instrumentation Engineers.

I was elected to my first professional society office in 1983, by the members of the Optical Society of America. I served on that board for three years, where my greatest achievement was the funding of a program to distribute optics kits to K-12 students and to devote one day at the annual meeting to secondary school teachers. In 1985, I was invited to run for board of governors for SPIE and was elected. For the year 1986 (the last year of my term of service for the Optical Society), I served on both the boards of the SPIE and the Optical Society of America. From 1986 through 1995 I served, in one capacity or another on the Board of Directors of SPIE.

THE 1994 PRESIDENCY

The years of my vice presidency and presidency were very full. In both years I served on the Europto board of directors (three trips per year to Europe). I served on the panel that selected Dr. James Pearson to be our new executive director, to follow Joe Yaver. Also, I went to St. Petersburg and Moscow three times in those two years, as part of the SPIE outreach and NASA industry surveys. During my tenure, the board established the standing committee for exhibits and a standing committee for international, which became the membership committee. We established the free SPIE libraries in St. Petersburg and Moscow. During my presidential year, we changed our name from The Society for Photo-Optical Instrumentation engineers to SPIE – The International Society for Optical Engineering.

Also during my presidential year I was the technical leader of the Astronomical Telescopes and Instruments meeting in Kona, Hawaii. This was the meeting that has

become the every two-year major meeting for all astronomers, optical scientists and instrumentation engineers. Our most recent meeting held in Glasgow, Scotland, in 2004 attracted almost 2,000 attendees and 1,500 written papers, published in 15 volumes. And the next one to be held in Orlando in May 2006 promises to be even larger.

TODAY AND LOOKING AHEAD

I was very pleased when the SPIE awarded me the George W. Goddard award and prize, for 2003, for my accomplishments in optical engineering. I am now looking for new horizons to cross, in my role as the chief technologist for the NASA astronomical search for origins program, where we are developing technology, designing and building large telescopes and interferometers in space for the detection, direct imaging and characterization of planets around stars other than our sun. For such a system we need milliarc-second spatial (angular) resolution and to control scattered light in the telescope to one part in 10 to the 10th or better. Our goal is to achieve this before 2020.