Special Issue Guest Editorial

X-Ray/EUV Optics

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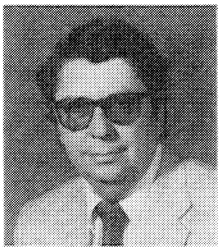
Last year when Jack Gaskill asked me to serve as Guest Editor for this special issue of *Optical Engineering* devoted to x-ray/EUV optics, he disclosed to me Gaskill's Law, which predicts the number of papers that will be received in relation to the number invited. I now know that Gaskill's Law does not apply to the field of x-ray optics. The avalanche of fine papers I received in response to my invitation was truly overwhelming. The papers received cannot be accommodated in a single issue of *Optical Engineering,* so more will follow in subsequent issues. I have grouped the papers such that each of the special issues will have papers for everyone, regardless of whether their interest lies in grazing incidence optics, multilayer x-ray mirror fabrication or characterization, normal incidence x-ray/EUV telescopes, x-ray microscopes, grazing incidence x-ray optics for telescopes or synchrotrons, thin film x-ray/EUV filters, or x-ray beamsplitters or gratings.

The June special issue begins with a description of an 8 keV x-ray microscope utilizing a phase modulating Soret-type Fresnel zone plate using magnetron sputtered and sliced transmissive optics. The technology used to produce these interesting optical elements is similar to that used to produce multilayer x-ray optics. Multilayer mirror systems may truly revolutionize the fields of soft x-ray/EUV astronomy, microscopy, and lithography. Advanced multilayer x-ray telescopes for solar astronomy (MSSTA) and for stellar astronomical observations from the ALEXIS satellite are described in the subsequent papers. These papers are followed by a discussion of multilayer x-ray beamsplitters and a paper discussing the theoretical limitations of the imaging capabilities of normal incidence x-ray telescopes. The final multilayer x-ray optics paper concerns ion polishing technology for the enhancement of the reflectivity of multilayer mirrors.

Thin film filters are a vital component of solar and astrophysical x-ray/EUV telescopes. In my judgment, the three papers concerning thin film filters that appear in this issue comprise the most complete data set of theoretical performance and measured thin film filter results heretofore published.

The final papers in this issue are devoted to grazing incidence x-ray optics. A theoretical analysis of a grazing incidence ring resonator system for free electron lasers and an alternative set of surface error descriptors for grazing incidence optics are provided. The ROSAT XUV Wide Field Camera is described. Much of the recent work for development of high throughput x-ray telescope systems has been devoted to advancements in the technology associated with highly nested thin foil grazing incidence x-ray mirrors. A status report on the thin foil telescope being developed for the Soviet Spectrum X-Gamma mission is given, and the results of scanning tunneling microscopy studies of thin foil mirrors are provided.

Many other superb papers on diverse aspects of x-ray optics have been received and are being processed for the July issue of *Optical Engineering,* although we expect that time and space contraints will require that some be held over to the August issue.



Richard B. Hoover is an astrophysicist at the Space Science Laboratory of NASA's Marshall Space Flight Center. He is currently the principal scientist for the Ultra-High Resolution XUV Spectroheliograph experiment, an array of multilayer x-ray telescopes selected for flight on the first U.S. space station, *Freedom.* Dr. Hoover began work in x-ray optics in 1967 with the x-ray mirrors flown on Skylab experiment S-056. He has developed grazing incidence and normal incidence x-ray telescopes and microscopes and hybrid instruments. He was co-investigator for the Stanford/MSFC X-Ray Spectroheliograph, which produced the first high resolution images of the sun with multilayer x-ray telescopes, and is now working on the Multi-Spectral Solar Telescope Array.

Dr. Hoover is internationally known for his work with diatoms. At the invitation of the Royal Zoological Society of Antwerp, Belgium, he researched their diatom collection and produced several thousand photomicrographs. Many were published in his article in the June 1979 *National Geographic,* others appeared in books, and some are now on display in the Smithsonian Museum of Natural History. Diatoms will be some of the first test objects for the Schwarzschild multilayer x-ray microscopes he is currently developing. He has authored more than a hundred papers on diffraction, x-ray optics, x-ray telescopes, photography, microscopy, astrophysics, and solar physics and holds 11 U.S. patents (related to x-ray optical systems, photographic film, and photomicroscopy systems), with 12 other patents pending. Dr. Hoover is on the summer faculty staff at Dauphin Island SEALAB and is a member of the graduate faculty with the University of Alabama at Birmingham. He is a member of SPIE and is listed in *American Men of Science.*