

O P T I C A L R E S E A R C H A S S O C I A T E S

Professional Experience

2000-present	Principal Engineer/Optical Design, Optical Research Associates
1999-2000	Engineering Fellow, Raytheon Electronic Systems, El Segundo, CA
1997-1999	Principal Engineer/Optical Design, Optical Research Associates
1990-1996	Senior Staff Engineer/Optical Design, Optical Research Associates
1986-1989	Staff Engineer/Optical Design, Optical Research Associates
1984-1986	Senior Engineer/Optical Design, Optical Research Associates
1980-1984	Graduate Research Associate, University of Arizona
1983 (Summer)	Optical Designer, Jet Propulsion Laboratory
1982 (Summer)	Optical Designer, Jet Propulsion Laboratory
1979 (Summer)	Engineering Assistant, Stanford Linear Accelerator Center, Stanford University

Education

1984	Ph.D. Degree in Optical Sciences, University of Arizona
1980	B.S. Degree in Physics, Stanford University

His experience is primarily in the area of the design, analysis, and tolerancing of optical systems. Some of his fabricated designs include refractive relay and projection lenses for CRT, laser, and light valve sources, anamorphic laser scanning lenses, dome projection lenses exceeding 180° field of view, visible and IR band lenses for detector testing, variable-magnification beam expanders for IR and visible wavelength lasers, helmet-mounted night vision optics, copy lenses for graphic arts, astronomical telescope optics, null lenses, high-speed optical disk objectives and laser diode collimators, a star tracker, catadioptric grating spectrometer, and head-up display lens. A significant fraction of his recent and ongoing work is in support of specialized advanced programs, conducted on-site at the customers' facilities, which has led to successfully fabricated optics.

Having been involved in numerous projects at ORA requiring all-reflective configurations, he has developed a variety of obscured and unobscured reflective designs for potential use in x-ray lithography, sensor testing, and ultraviolet through IR band imaging. He has developed and documented user-defined constraint techniques to aid the optimization of such systems while controlling their packaging constraints, and has received two patents in the field of unobscured reflective optics. His laboratory experience in this area includes interferogram analysis of multi-mirror systems in support of compensator adjustment for alignment. Recent design work has been in the area of freeform mirror surfaces, whose non-rotationally symmetric shape can significantly improve performance relative to rotationally symmetric shapes.

Awards/Honors

2000	Raytheon company excellence awards for optical design accomplishments.
1990	NASA Tech Brief, "Optical Modeling of Segmented Mirror Telescopes" (co-authored with P. Manhart)
1985	NASA Tech Brief, "Manufacture of a Reflecting Slit Optical Element" (co-author).
1983	NASA Tech Brief, "Addition to Triple Reflecting Schmidt-Littrow Prism Imaging Spectrometer" (co-author)
1983	SPIE Scholarship in Optical Engineering

Patents

- U.S. 5,610,751 Co-inventor of Optical Scanning Device Having a Spherical Exit Window (assigned to Speedring Systems).
- U.S. 5,309,276 Catoptric Optical System.
- U.S. 5,063,586 Co-inventor of Apparatus for Semiconductor Lithography (assigned to AT & T Bell Laboratories).

Publications

- “Design of a Mid-IR Polarimeter for SOFIA,” (with J. McGuire), Proc. SPIE 1, (2008).
- “Design of a discrete scan laser focusing system with a ring grating scan element,” Proc. SPIE Annual Meeting, (August 2008).
- “A conceptual design for the Thirty Meter Telescope Alignment and Phasing System,” (with M. Troy, G. Chanan, et al); Proc. SPIE conference on Astronomical Telescopes and Instrumentation, (June 2008).
- “Four-mirror compact afocal telescope with dual exit pupil,” OSA IODC Conference, (June 2006).
- “Optical Design of a Panoramic, Wide Spectral Band, Infrared Fisheye Lens,” (with H. Spencer and J. Hoffman), OSA IODC Conference, (June 2006).
- “Design, fabrication, assembly, and testing of the Florida Image Slicer for Infrared Cosmology and Astrophysics (FISICA) integral field unit,” (with S. Eikenberry, J. Hoffman, K. Thompson, et al); Proc. SPIE European International Symposium on Astronomical Telescopes, (June 2004).
- “FISICA: the Florida image slicer for infrared cosmology and astrophysics,” (with S. Eikenberry, J. Hoffman, K. Thompson, et al); Proc. SPIE 5492, 1264-1273, (2004).
- “Overview and design of the Canarias infrared camera experiment (CIRCE),” (with M. Edwards, S. Eikenberry, et al); Proc. SPIE 5492; 1710-1715, (2004).
- “Benefits of Freeform Mirror Surfaces in Optical Design,” (with K. Thompson), Invited Paper, American Society for Precision Engineering, (2004).
- “Curved Focal Surfaces: Design Optimization Through Symmetry, Not Complexity,” Photonics Tech Briefs, (April 2003).
- “Unobscured Mirror Designs,” OSA IODC Conference, (June 2002).
- “Optical Design of a 10x Zoom Lens Objective for the Visible Wavelength Band,” Proc. SPIE 4441B, (July 2001).
- “Tolerance Analysis of Null Lenses Using End-use System Performance Criterion,” Optical Engineering, (July 2000).
- “Optical design of the National Ignition Facility main laser and switchyard/target area beam transport systems,” (with J. Miller, R. English et al); Proc. SPIE 3492, 294-299 (1999).
- “Blue channel of the Keck low-resolution imaging spectrometer,” (with J. McCarthy, D. Koch, et al); Proc. SPIE 3355, 81-92 (1998).

“Conformal Optics: Key Issues in a Developing Technology,” (with K. Thompson), Optics & Photonics News, (October 1997).

“Compensating Lens Design and Testing of the COSTAR Optics for the HST,” OSA IODC 22, 284, (1994).

“Compact Unobscured Four-Mirror Optical System,” OSA IODC 22, 356, (1994).

“Design of a High Speed UV-Transmitting Camera for the Keck LRIS,” (with J. McCarthy), Proc. SPIE 2198, 1096, (1994).

“Reflective Optical Designs for Soft X-ray Projection Lithography,” (with T. Jewell and K. Thompson), Proc. SPIE 1527, 163, (1991).

“Design of Reflective Relay for Soft X-ray Lithography,” (with T. Jewell), Proc. SPIE 1354, 330, (1990).

“Reflective Systems Design Study for Soft X-ray Projection Lithography,” (with T. Jewell and K. Thompson), J. Vac. Sci. Technology B 8 (6), 1519, (1990).

“Segmented Mirror Manufacturing and Alignment Tolerances,” (with P. Manhart); Proc. SPIE 1114, 387, (1989).

“Algorithm for the Computation of the Filter Transmission Function in Optical Systems,” (with M. Schaaf and F. Cucu), OPTIK 81, 1, 21, (1988).

“Control of Packaging Constraints in the Optimization of Unobscured Reflective Systems,” Proc. SPIE 751, 143, (1987).

“Optical Design Issues in Electro-Optical Systems Integration,” (with R. Hilbert), Proc. SPIE 762, 1, (1987).

“A Null Lens Design Approach for Centrally-Obscured Components,” Proc. SPIE 679, 17, (1986).

“Null Tests for Oblate Spheroids,” (with R. Parks), Applied Optics 23, 8, 1246, (1984).

“Nonstandard Representations of Aspheric Surfaces in a Telescope Design,” Applied Optics 23, 520, (1984).

“Nonstandard Representations of Aspheric Surfaces in Optical Design,” Ph.D. Dissertation, University of Arizona, JOSA 1, 1237, (1984).

“Reflecting Schmidt Imaging Spectrometers,” (with J. Breckinridge, N. Page, and R. Shannon), Applied Optics 22, 1175, (1983).

Professional Societies

Member, SPIE The International Society for Optical Engineering