

## **J. Michael Rodgers, Ph.D.**

### **Professional Experience**

2010-present	Principal Engineer/Optical Design, Synopsys
2000-2010	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	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

Mr. Rodgers' experience is primarily in the areas 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, head-up display lens, and cinema projection lenses. 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 and Synopsys 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

- "Optical and opto-mechanical design of the PRIMA telescope", SPIE Annual Meeting, Aug. 2023 (co-author).
- "Optical and opto-mechanical design of spectrometers for PRIMA", SPIE Annual Meeting, Aug. 2023 (co-author).
- "Next-generation active telescope for space astronomy," Journal of Astronomical Telescopes, Instruments, and Systems, Vol. 8, Issue 4, 044005 (December 2022) (co-author).
- "Optical Design of the Mastcam-Z Lenses." OSA Optical Design and Fabrication Congress/International Optical Design Conference, June 2021 (co-author).
- "The Galaxy Evolution Probe," J. Astron. Telesc. Instrum. Syst. 7(3), 034004 (2021), doi: 10.1117/1.JATIS.7.3.034004 (co-author).
- "ATSA: a cold, active telescope for Space Astronomy." Proc. SPIE 11443, Space Telescopes and Instrumentation 2020, SPIE Astronomical Telescopes + Instrumentation, December 2020 (co-author).
- "Habitable Exoplanet Observatory (HabEx) starshade-only architectures, " SPIE Annual Meeting, 2019 (co-author).
- "The WFIRST Coronagraph Instrument Phase B Optical Design," SPIE Annual Meeting, 2019.
- "The Galaxy Evolution Probe: A concept for a mid and far-infrared space observatory", Proc. SPIE. 10698, Space Telescopes and Instrumentation 2018 (co-author).
- "Architecture for space-based exoplanet spectroscopy in the mid-infrared", Proc. SPIE 10698, Space Telescopes and Instrumentation 2018: Optical, Infrared, and Millimeter Wave, 106980L (6 July 2018) (co-author).

"HabEx Lite: a Starshade-only Habitable Exoplanet Imager Alternative", Proc. SPIE 10698, Space Telescopes and Instrumentation 2018: Optical, Infrared, and Millimeter Wave, 106980X (6 July 2018) (co-author).

"Validation of the corrective optics on the Hubble Space Telescope 1st Servicing Mission," J. Astron. Telesc. Instrum. Syst. 2(3), 034001 (2016), doi: 10.1117/1.JATIS.2.3.034001 (co-author).

"Freeform Surfaces for Low Distortion Reflective Imagers", in International Optical Design Conference, OSA Technical Digest (CD) (Optical Society of America, 2017), paper ITu2A3.

"Considerations for Selecting a Retrosphere in Interferometric Optical Testing of Objectives," in International Optical Design Conference, OSA Technical Digest (CD) (Optical Society of America, 2010), paper ITuD1.

"The Canarias Infrared Camera Experiment (CIRCE)," M. L. Edwards, S. S. Eikenberry, A. Marin-Franch, M. Rodgers, J. Julian, K. Hanna SPIE Astronomical Telescopes and Instrumentation, 2008.

"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,” Rodgers, Proc. SPIE 751, 143, (1987).

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

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

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

“Nonstandard Representations of Aspheric Surfaces in a Telescope Design,” Rodgers, 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,” J. B. Breckinridge, N. A. Page, R. R. Shannon, and J. M. Rodgers, Applied Optics 22, 1175, (1983).

## **Professional Societies**

Member, SPIE The International Society for Optical Engineering

## Patents

US 9548286	Solid State Lights with Thermal Control Elements
US 9497820	Calibration Method for LED Lighting System
US 7630002	Specular Reflection Reduction Using Multiple Cameras
US 7012633	Color Calibration Method for Imaging Color Measurement Device
US 6982744	Multi-point Calibration Method for Imaging Light and Color Measurement Device
US 6969181	Fully Recessed Unit Equipment Luminaire
US 6056426	Monolithic Beam Shaping Light Output Device
US 5931576	Optical Coupler for Distributive Lighting System

## Publications

S. Magarill, W.J. Cassarly, D. Jenkins, Y. Yang, X. Yu, and G. Liu "Parametric model of volumetric scattering", Proc. SPIE 10590, International Optical Design Conference 2017, 1059023 (27 November 2017).

Huiying Wu and D. Jenkins "Phosphor modeling and characterization," Optical Engineering 53(11), 114107 (20 November 2014).

D. Jenkins. "Editorial: Are LEDs finally poised to gain universal acceptance?" ECN Magazine, Jun 10, 2014

S. Magarill and D. Jenkins, "Hollow Backlight Parametric Study," in Classical Optics 2014, OSA Technical Digest (online) (Optica Publishing Group, 2014).

Jenkins, D., "Mura Defects: Moving Beyond Display Industry Standards", in Information Display, Society for Information Display, Vol. 19, No. 12 (December 2003).

Jenkins, D., "Flat Panel Display Metrology Finds More than Meets the Eye: Camera-based systems for defect detection reduce production costs and improve quality", in Photonics Spectra, Laurin Publishing, (August 2003).

Cassarly, W.J., D.R. Jenkins, and H. Mönch, "Accurate Illumination System Predictions Using Measured Spatial Luminance Distributions", in Modeling and Characterization of Light Sources, Proceedings of SPIE Vol. 4775 (SPIE, Bellingham, WA 2002).

Jenkins, D.R., D.C. Beuzekom, G. Kollman, C.B. Wooley, and R.F. Rykowski, "Digital Imaging Colorimeter for Fast Measurement of Chromaticity Coordinate and Luminance Uniformity of Displays", in Flat Panel Display Technology and Display Metrology II, Edward F. Kelley; Apostolos T. Voutsas, Editors, Proceedings of SPIE Vol. 4295 (SPIE, Bellingham, WA 2001).

Jenkins, D. and H.Mönch. H., "Source Imaging Goniometer Method of Light Source Characterization for Accurate Projection System Design, Society for Information Display Conference, Long Beach, CA, (Jan 1, 2000).

Jenkins, D.R, B. Wang, S. Banerjee, and J. Jiao, "Low Beam Head Lamp Design Using Distributive Lighting System", Society of Automotive Engineers Annual Meeting 1996, Reprinted in Automotive Design Advancements in Human Factors: Improving Drivers' Comfort and Performance (Society of Automotive Engineers, Inc. Warrendale, PA, 1996).

Conti, R.S., P.H. Bucksbaum, D. Kilper and D. Jenkins, "New Tests of P-Conserving T-Violation in Atoms", in Proceedings of the Annual Meeting of the American Physical Society (1991).

## **Professional Societies**

Member Society of Photo-Optical Instrumentation Engineers (SPIE)  
Member Optica  
Member Illumination Engineering Society (IESNA)  
Member Society of Automotive Engineers (SAE)  
Member CIE