

# DAVID J. FISCHER, Ph.D.

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## PROFESSIONAL OBJECTIVES

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Design and implement optical metrology systems in support of manufacturing or research. Lead teams to perform novel engineering and scientific tests.

## PROFESSIONAL EXPERIENCE

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### ITT Space Systems Division

Rochester, NY

#### *Optical Metrology Engineer (Aug. 2002 – Present)*

- Currently Test Engineer for in-process testing of an off-axis, aspheric, segmented mirror.
  - Developing error budgets, optical sensitivity models of system to guide test-set alignment.
  - Planning data analysis process, alignment plans, and writing Test Procedure.
  - Will perform test activity, supporting two-shift test teams.
- Worked with novel Wavefront Sensor (WFS) with increasing responsibility over four years, from acceptance testing to final-use test integration.
  - Was metrology lead for two acceptance tests of high-resolution wavefront sensor.
    - Met test requirements with calibrated test set that created controlled wavefront tilts of  $100 \pm 5$  nano-radians.
    - Developed test plan and error budgets. Designed and implemented calibration methods for custom metrology hardware, including PZT, translation stages, and beam expander. Designed assembly and alignment procedures for test hardware.
    - Directed and worked closely with assisting optical engineer. Worked with designer for custom fixtures and with assembly crew on system construction. Supervised integration of test hardware in the greater support structure.
  - Managed \$820,000 in upgrade contracts for WFS control and analysis software and control hardware over three years preparing for tests.
    - Specified upgrades to WFS vendor. Worked closely with vendor's senior scientist and software engineer to plan and implement upgrades. Planned upgrades per evolving usage requirements.
    - Designed and wrote custom analysis software (in Matlab) for WFS data, improving efficiency. Tools subsequently integrated into vendor's software.
- Managed WFS in large-scale test event, with WFS as primary instrument.
  - Guided systems-level planning of test regarding WFS capabilities, interface-control documentation for hardware and software integration, data validity bounds, and test schedule.
  - Wrote 300-page test procedure for WFS operation and in-test data verification.
  - Trained support engineers to use WFS and related support hardware.
  - Managed two 4-person teams, covering 20 hours of testing with 10-hour shifts. (Final test event took 10 days.)
  - Analyzed final WFS test data and documented WFS test performance.

- Aligned 2.5 m diameter collimator
  - Designed test plan to align 2.5 m diameter Gregorian Collimator, for testing prototype telescope. Aligned secondary to primary mirror via three interferometric test techniques, including sub-aperture interferometry. Analyzed interferometric data incorporating previously measured surface backouts.
  - Identified unexpected dynamic warping of support table and (with aid of alignment team) developed workaround to align system with no absolute position knowledge.
  - Worked closely with senior engineer and technician, learning from their 60 years combined experience.
- Lead development of surface test and phasing alignment of 3 m aspheric segmented mirror.
  - Developed and managed 9-month schedule, \$250,000 budget, and team of two support engineers. Leveraged internal technologies to meet aggressive schedule.
  - Designed refractive null lens for surface figure test; null was fabricated by sub-contractor vendor per specifications. Improved design from original concept, saving \$30,000.
  - Developed error budget, test plan, and oversaw segment phasing test development.
  - Successfully transitioned test-lead mid-program during program hiatus and urgent new project requirements required my support of WFS test integration (described above).
- Supported program teams on short-term basis as resource demands required.
  - Wrote metrology section of winning \$13M JPL proposal to manufacture off-axis asphere. Managed design tasks by dividing analysis among engineers. Proposal included test-set design comparisons and error budget. Designs included methods to meet measurement requirements for spatial frequency regimes and radius and conic constant.
  - Supported integration and test planning for James Webb Space Telescope. Simplified design of focal-plane interferometer. Developed verification requirements for multi-wavelength interferometer.

**Chapman Instruments**

Rochester, NY

*Consultant (April 1998 – Jan. 2000)*

- Part-time work during Ph.D. research.
- Extended modeling and simulation of profilometer, MP2000+ Interferometer.

*Optical Engineer (June 1997 – Feb. 1998)*

- Analyzed and identified limitations to measurement accuracy of MP2000+ Interferometer. Investigated improvement methods via theoretical and empirical models.
- Provided measurements and data analysis for customers. Advised on purchasing decisions for hardware and software. Participated in planning sessions for device and patent ideas.

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**TECHNICAL SKILLS**

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**Specialized:** Single Scope Background Investigation (SSBI) conducted by the U.S. government.**Software:** CODE V, OSLO, Matlab, Mathematica, 4Sight, MS Project.**Test Tools:** Laser Tracker, Coordinate Measuring Machine (CMM), PhaseCam, Theodolite, Wavefront Sensor (WFS), Laser Vibrometer.

## EDUCATION

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**The Institute of Optics, University of Rochester** Rochester, NY

*Ph.D. Optics (1993 – 2002)*

- Thesis: “Gradient-Index Ophthalmic Lens Design and Polymer Material Studies”
  - Fabricated gradient-index (GRIN) co-polymers.
  - Constructed phase-shifting interferometer and measured polymer diffusion in real-time.
  - Developed analytical methods for designing GRIN ophthalmic lenses of unifocal, multifocal, radially symmetric and asymmetric configurations. Developed software to model and optimize GRIN lenses using cubic B-Splines and polynomials.
- GPA 3.8/4.0
- Advisor: Duncan T. Moore, Professor of Optics

**Rose-Hulman Institute of Technology** Terre Haute, IN

*B.S. Applied Optics (1989 – 1993)*

- Graduated Summa Cum Laude. GPA 3.95/4.0.
- Course work included optical physics, computer algorithms, and circuits and systems analysis.

## PUBLICATIONS & PRESENTATIONS

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**“Acceptance testing of a large aperture dynamic wavefront sensor”**

D. J. Fischer, A. Wertheimer, L. Hill, Proceedings of SPIE **5553**, pp. 309-318 (2004). (Presented at SPIE Annual Meeting, July 2004.)

**“I like your GRIN: Design methods for gradient-index progressive addition lenses,”** D. J. Fischer, D. T. Moore, Presented at IOOC June 5, 2002.

**“Design and manufacture of a gradient-index axicon,”** D. J. Fischer, C. J. Harkrider, D. T. Moore, Applied Optics **39** (16) pp. 2687-94 (2000).

**“Design and manufacture of a gradient-index axicon,”** D. J. Fischer, C. J. Harkrider, D. T. Moore, Presented at OSA Annual Meeting, September 1999 (San Jose, CA). Also at October 1999 Industrial Associates Meeting (The Institute of Optics).

**“Design of three-element night-vision goggle objectives,”** J. L. Rouke, M. K. Crawford, D. J. Fischer *et al.*, Applied Optics **37** (4), 622-6 (1998).

## PROFESSIONAL ORGANIZATIONS

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**Optical Society of America (OSA)**

**Toastmasters International (Daybreakers, Club 3685)**

- Member since 1998.
- Club Treasurer (2008), President (2003), V.P. Membership (2002), Sgt. at Arms (1999-2001).
- Achieved CTM (Competent Toastmaster) and CL (Competent Leader) certifications.

## REFERENCES

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Available upon request