

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

Kevin P. Thompson

Professional Experience

1998-Present	Vice President of Optical Engineering Services, Optical Research Associates
1996-1998	Director of Optical Engineering Services, Optical Research Associates
1994-1996	Acting Director of Optical Engineering Services, Optical Research Associates
1989-1994	Assistant Director of Optical Engineering Services, Optical Research Associates
1986-1989	Senior Staff Engineer/Optical Design, Optical Research Associates
1985-1986	Senior Optical Designer, Perkin-Elmer
1980-1985	Optical Designer, Perkin-Elmer
1978-1980	Optical Engineer, Talandic Research (part-time)
1978 (Summer)	Optical Analyst, Perkin-Elmer
1976-1980	Research Associate, University of Arizona, Optical Sciences Center

Education

1980	Ph.D. Degree in Optical Sciences, University of Arizona
1979	M.S. Degree in Optical Sciences, University of Arizona
1976	B.S. Degree in Astrophysics, University of Minnesota
1976	B.S. Degree in Physics, University of Minnesota

Dr. Thompson's experience has been concentrated in three areas. Most recently he has been leading a team of optical designers and optical engineers in both imaging and illumination optics providing state-of-the-art optical system development services throughout the world. He has full responsibility for all aspects of the optical engineering activities at ORA including strategic direction, marketing, sales, customer development, and technical oversight. In this role he typically works with over 100 companies a year across the spectrum of optics. In addition, he initiated securing government funding for advancing the state of the art in optical design software where he has led proposals for over \$4M in government funding from DARPA, SBIR, and ATP in conformal optics, illumination optics for EUV lithography, advanced software for modeling photonic devices, the incorporation of LEDs into Runway Lighting, and advanced developments in solar energy.

Prior to entering management, he performed as an integral member of small working teams formed to provide state-of-the-art optical hardware functioning in complex, demanding, customer-defined scenarios. In this role, responsibilities included: system engineering, i.e., transforming the scenario into an appropriate set of optical system specifications, conceptual and detailed optical design, in-depth computer modeling of the optical system to support performance prediction, error budget derivation, flowdown and piece part tolerance allocation, mount design for dynamic and environmental stability, assembly/test procedure development and implementation, vendor selection and monitoring for piece part manufacture, acceptance test plan development, acting as interface between design engineers and assembly technicians, and development and presentation of all optical information to the customer from proposal through final design review on through fabrication and alignment support. In addition to optical design, Dr. Thompson is particularly experienced and skilled in optical alignment and testing. His first assignment in optics was to provide the optical layout for Solar 1, the first large scale central tower solar collector ever built, at Sandia.

His third area of concentration is in development of new applications for optical design software. Areas of expertise include: nonsymmetric design techniques, sensitivity analysis methods for one-of-a-kind optical systems, holographic optical design tools, and enhanced user environments for improving flexibility for state-of-the-art design problems. Currently, he is reviving his work on nodal aberration theory and applying it to recent problems in the alignment of TMA (Three Mirror Anastigmatic) telescopes, particularly those slated for the James Webb Space Telescope (JWST).

Optical systems for which he has been the principal optical designer include: null lens designs for the highly successful Hubble 1st Servicing Mission, optical modeling and analysis for the first generation EUV illuminator for lithography (for the VNL alpha optics), development of one of earliest patents in EUV projection optics for ATT/Bell Labs, Gen III night vision systems; hybrid prototypes with binary optics; all reflective systems for normal incidence soft X-ray (e.g., EUV) lithography; machine vision systems for production quality control; null lenses for nonsymmetric mirrors; high frame rate acousto-optic IR scene generators; a thermally compensated high performance dual mode FLIR; two multiband active tracking radiometric imaging systems; a 3-bin real-time UV shearing interferometer; projection optics for dome simulators; far-field Gaussian beam shapers; multiband spectrometers; an ultra-wideband refractive imager; missile seeker heads; f-theta laser scan lenses; an acousto-optic laser projector for large format color displays; anamorphic beam expanders and projectors; and a proof of concept broad-band holographic imaging system. These projects have often led to field deployed hardware systems. He has also provided support to programs for a variety of systems (ALPHA, BSTS, SBL), the Advanced X-ray Astrophysical Facility (AXAF, now in-orbit as Chandra), the Solar Optical Telescope (SOT), the Space Telescope Fine Guidance System (ST-FGS), and the second generation Wide Field and Planetary Cameras (WFPC II), and COSTAR.

Patents

- U.S. 5,315,629 Ringfield Lithography - A four mirror, unobscured, coaxial, scanning, reduction optical system for use in the extreme UV (~130 Angstroms) with normal incidence coatings.
- U.S. 4,650,321 Spatial/Spectral Real Time Imaging Systems - This patent combines electronic signal processing from a CCD array with a form of slitless spectrograph to provide simultaneous spatial imaging and spectral tagging for narrow band point sources.

Peer Reviewed Publications

As a lead author:

“The multi-nodal 5th order optical aberrations of optical systems without rotational symmetry Part 1: Spherical Aberration,” Josa A, (2008).

“A real ray-based method for locating individual surface aberration field centers in imaging optical systems without symmetry,” (with T. Schmid, O. Cakmakci, and J.P. Rolland) submitted to JOSA A (2008).

“The Misalignment induced aberrations of TMA telescopes,” (with T. Schmid and J.P. Rolland) submitted to Optics Express, (2008).

Kevin P. Thompson (Cont.)

"Description of the third-order optical aberrations of near-circular pupil optical systems without symmetry," JOSA A **22**, 1389-1401, (2005).

As a contributing coauthor:

"Gabor domain optical coherence microscopy", Proc. SPIE, 7139, (2008).

"3D Microscopy using embedded liquid lens," S. Murali with K.P. Thompson, and J.P. Rolland, submitted to Optics Letters, (2008).

"Differential Shack-Hartmann curvature sensor: local principal curvature measurements," Weiyu Zou with K.P. Thompson and J.P. Rolland, JOSA A **25**, 9, 2331-2337, (2008).

"Reflective systems design study for soft X-ray projection lithography," J. Rodgers with K.P. Thompson and T. Jewell, J. Vac. Sci. Technology B **8** (6), 1519, (Nov/Dec 1990).

Short Courses

"Optical design techniques for optical systems containing conformal surfaces," OSA Short Course OSA Annual Meeting, Long Beach, CA, (1997).

"Methods of optical design," ORA Introductory 1-Day Course, Pasadena, CA (1996).

Other Publications

"Understanding the alignment of TMA telescopes with nodal aberration theory," (with T. Schmid and J.P. Rolland), Plenary, SPIE Photonics Europe, Glasgow, Proc. SPIE, 7xxx-xx, (2008).

"Meshfree approximation methods for free-form surface representation in optical design with applications to head-worn displays," O. Cakmakci with J.P. Rolland, K.P. Thompson and G.E. Fasshauer, Invited, Proc. SPIE 70xx-xx, (2008).

"Design efficiency of 3188 Lens Designs," O. Cakmakci with J.P. Rolland, K.P. Thompson, and J. Rogers, Proc. SPIE 70xx-xx (2008).

"Superresolution imaging combining the design of an optical coherence microscope objective with liquid-lens based dynamic focusing capability and computational methods," S. Murali with A. Jain, H. Foroosh, K.P. Thompson, and J.P. Rolland, Proc. SPIE 7061-46, (2008).

"Alignment induced aberration fields of next generation telescopes," T. Schmid with K.P. Thompson and J.P. Rolland, Invited, Proc. SPIE 7xxx-xx, (2008).

"The alignment of two-mirror astronomical telescopes; the astigmatic component," T. Schmid with K.P. Thompson and J.P. Rolland, SPIE Astronomy and Astrophysics, Marseilles, Proc. SPIE 7017-11, (2008).

"Alignment induced aberration fields in next generation telescopes," (with T. Schmid and J.P. Rolland), Invited, SPIE Photonics Asia, Proc. SPIE 6834, (2007).

"The earliest history of computer-aid optical design on large computers," Previously Classified Work by James G. Baker 1945-1954, Invited, Proc. SPIE Vol 6668, (2007).

Kevin P. Thompson (Cont.)

“Task-based evaluation of practical lens designs for lens-coupled digital mammography systems,” L. Chen with L. Foo and K.P. Thompson, Proc. SPIE 6515, (2007).

The “1st” Optical Convention (in English), The 1905 Optical Convention in London England,” Invited, International Optical Design Conference, Proc. SPIE 6342 (2006).

“Early Books in Optics and Optical Design: A Complete System of Opticks & the Edinburgh Encyclopedia,” Optics and Photonics News, 29-33, (October 2005).

“Benefits of Freeform Mirror Surfaces in Optical Design,” J. Rodgers with K.P. Thompson, Invited, American Society for Precision Engineering, (2004).

“Reinterpreting Coddington: Correcting 150 Years of Confusion,” Invited, Proc. SPIE: A Tribute to Robert Shannon and Roland Shack, (2004).

"Design, fabrication, assembly, and testing of the FISICA integral field unit," S. Eikenberry with P. Glenn, C. G. Hull Allen, J. Hoffman, J. Rodgers, K.P. Thompson, B. Myrick, L. Comstock, S. Flint, G. Boreman, R. Elston, R. Guzman, J. Julian, N. Raines, Proc. SPIE 5492, (June 2004).

“1998 International Optics Design Conference Proceedings,” Co-editor (with L. Gardner), Proc. SPIE 3482, (1998).

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

“Incorporating Aspherics into your Technology,” (with D. Bajuk), OSA Annual Meeting, Rochester, NY, (1996).

“Practical Methods for the Optical Design of Systems without Symmetry,” Proc. SPIE 2774, p2, (1996).

“Optical Design, Information and Insights,” Invited, Presented to: Committee on Optical Science and Engineering, National Academy of Sciences, (1996).

“Key to cost effective optical systems maximize the number of qualified fabricators,” (with L Hoyle), OSA/SPIE, International Optics Design Conference Proc. 22, p208, (1994).

“Null Lens Designs and Testing of the Spherical Aberration Compensating Wide Field and Planetary Camera (WF/PC II) Secondaries for the Hubble Space Telescope (HST),” (with J. Meckel), OSA/SPIE International Optics Design Conference Proc. 22, p280, (1994).

“Compensating Lens Designs and Testing of the COSTAR Optics,” (with B. Kestner and J. Rodgers), OSA/SPIE International Optics Design Conference Proc. 22, p284, (1994).

“Design of a Multiwavelength Scophony Infrared Scene Projector,” (with J. Kircher, R. Korniski, S. Marlow, and R. Richwine), Proc. SPIE 2000, p76, (1993).

“Tolerancing the .065 NA Microscope Objective with CODE V,” (with B. Irving), Presented at OPTCON, (1992).

“Reflective Optical Designs for Soft X-ray Projection Lithography,” (with T. Jewell and J. Rodgers), Proc. SPIE 1527, p163, (1991).

Kevin P. Thompson (Cont.)

“The Importance of Dispersion Tolerances in Infrared Lens Design,” (with R. Korniski), Proc. SPIE 1354, p402, (1991).

“Beyond Optical Design: Interaction between the Lens Designer and the Real World,” Proc. SPIE 554, p426, (1985).

“Techniques for characterizing optical system assembly,” Presented at OSA Annual Meeting, October (1984). Abstract in JOSA A **1**, 12, 1227, (1984).

“Techniques for characterizing optical system fabrication,” Proc. SPIE 483, p16, (1984).

“Astigmatic Focal Surfaces in General Optical Systems: A New Look at an Old Aberration,” Presented at OSA Annual Meeting, October (1980). Abstract in JOSA **72**, 1726, (1982).

“A Graphic Approach to the Analysis of Perturbed Optical Systems,” Proc. SPIE 237, p127, (1980).

“Aberration Fields in Tilted and Decentered Optical System,” Ph.D. dissertation, University of Arizona, Tucson, AZ, (1980).

“Aberration Fields in Unobscured Mirror Systems,” Presented at OSA Annual Meeting, October (1980). Abstract in JOSA **70**, 2, 1603, (1980).

“Image Degradation in Misaligned Optical Systems,” Presented at the OSA Annual Meeting, October (1979). Abstract in JOSA **69**, 1428, (1979).

Professional Societies

Fellow , OSA	Optical Society of America
2003-present:	Topical Editor, JoSa A, Geometrical Optics
1995-1997	Chairman, Optical Design Technical Group
1998	Cochairman, 1998 International Optics Design Conference
Fellow , SPIE	The International Society for Optical Engineering
Member, AAAS	The American Association for the Advancement of Science
Member, IEEE	The Institute of Electrical and Electronics Engineer
Member, SAE	The Society of Automotive Engineers
Member, SID	The Society for Information Display
Member, ASPE	The American Society of Precision Engineering