



LTI Optics, LLC
10850 Dover Street
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Resume

Mark Jongewaard

President & Principal, LTI Optics, LLC
Adjunct Professor, University of Colorado
President, Council for Optical Radiation Measurements
Board Member, Rocky Mountain Lighting Academy

Profile

Started as an illumination engineer at Lighting Technologies, Inc. (LTI) in 1989 and became the Vice President, Director of the Optics Division, and part owner until 2006 when LTI was sold to Musco Sports Lighting. Since the sale, Mark & business partner Ryan Kelley led the formation of LTI Optics (LTIO), which spun off from Musco and continues the optics related business from LTI. This includes the development and sale of Photopia, the most widely used optical design software in the architectural lighting industry, used in 49 countries around the world, as well as providing optical design services for illumination based (non-imaging) optical systems.

Mark has extensive experience in lighting software development, lighting and optical analysis, illumination optical design and training. The broad experience in lighting analysis and algorithm development influenced the calculation modules in all of LTI's products including Photopia, Lumen-Micro and Lumen Designer. Through the sales & support of the Photopia software, work on optical design projects and role as training seminar instructor, Mark has maintained close personal relationships with the R&D departments of lighting manufacturers around the world. This position has provided Mark with a unique perspective of the global lighting industry and insights into its major contributors.

Mark is also active in illumination/optical engineering education teaching a full semester course named "Optical Design for Illumination and Solid State Lighting" at the University of Colorado, Boulder as an adjunct professor, in the Architectural Engineering department since 2009. Mark also serves on the advisory board and is an instructor for the Rocky Mountain Lighting Academy (RMLA), an extension of the lighting program at CU that provides continuing education to professionals working in the lighting industry.

Experience

Software Development, Optical Design: Product manager and principal designer of Photopia, a general 3D probabilistic raytracing program for designing and analyzing illumination and other non-imaging optical systems. Mark leads the product definition, design tool development, raytracing analysis algorithm development, user interface requirements, testing and verification of optical performance predictions, documentation development, marketing, and production. Photopia was first released in 1996.



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Material Directional Reflectance/Transmittance Measurements: Responsible for developing methods for material BRDF/BTDF measurements ranging from a custom built goniometric based measurement device to a new high resolution HDR imaging based measurement device. Integrated reflectance/transmittance measurements are also made in a custom designed and built integrating sphere that allows data to be collected for a wide range of light incidence angle. Measurement methods have been internally developed to suit the needs of Photopia and the wide range of illumination based optical projects it accepts. Methods have been verified by comparison of Photopia's results to measured photometric data for the complete optical systems since its release in 1996.

Light Source Modeling: Developed light source modeling methods appropriate for all types of real physical sources including their geometric, material, luminous and spectral properties. Electric source types include fluorescent, incandescent/halogen, LEDs, metal halide, mercury vapor, high and low pressure sodium, sulfur, argon arc, xenon flash tubes, induction and LEP. Various modeling methods have been tested against physical measurements to determine their accuracy in various types of optics. Source models representing daylight have also been developed for the sun and sky dome components for various sky conditions using IESNA and CIE standard sky models and tested against physical measurement of daylight devices.

Software Development, Lighting Systems Design: Performed the algorithm development, coding, debugging and verification of the calculation methods used for the daylighting calculations in Lumen-Micro versions 5 through 2000. A key participant in the algorithm development for all of LTI's analysis programs.

Optical Design: Project manager and principal designer on a wide variety of specialized optical design projects including applications in signal, architectural, horticulture, industrial, theater, consumer, medical, aerospace, and automotive lighting. Additional optical designs have been for light pipes, optical sensors, UV curing & disinfection, solar and daylight concentration & collection. Projects have been done for clients throughout North America, Europe and Asia. Optical components have included reflectors, refractors and light pipes using light sources ranging from LEDs up to 300KW arc lamps. Independent research includes the optical design of a passive daylight collection and delivery system using hollow light guides. Inventor or co-inventor on several design patents and patents pending.

Optical Design Training: Have developed and provided seminars in the use of Photopia and optical design techniques for product design engineers at lighting companies around the world since 1990. All seminars are personalized to the specific needs of each company. Have also developed & teach a full semester course in optical design including photometric laboratory activities for the University of Colorado at Boulder. The CU class has been continuously offered each year since 2009.

Education

- Bachelor of Science, Architectural Engineering, Illumination Emphasis, University of Colorado, May 1989.
- Master of Science, Civil Engineering, Illumination Emphasis, University of Colorado, May 1991.

Professional Affiliations

- Member, IESNA.
- Member, CIE TC 3.33, the technical committee responsible for testing lighting analysis software
- President, Council for Optical & Radiation Measurements (CORM)
- Board Member, Rocky Mountain Lighting Academy, University of Colorado, Boulder

Issued Patents

1. United States Patent 5,347,259, "Strobe warning light"
2. United States Patent 5,951,139, "Surgical light with reflector-lamps and flat reflector panels"
3. United States Patent 6,558,023, "Luminaire which provides an evenly distributed lighting pattern"
4. United States Patent 6,561,670, "Semi-recessed downlight wall wash canopy luminaire"
5. United States Patent 6,945,675, "Fascia wash luminaire"
6. United States Patent 7,549,977, "Front load pressure jacket system with syringe holder and light illumination"
7. United States Patent 8,047,686, "Multiple light-emitting element heat pipe assembly"
8. United States Patent 8,187,225, "Fluid injection system and pressure jacket assembly with syringe illumination"
9. United States Patent 8,378,322, "Micro-channel-cooled high heat load light emitting device"
10. United States Patent 8,723,146, "Micro-channel-cooled high heat load light emitting device"
11. United States Patent 9,255,695, "Illumination Lens for LED Backlights"
12. United States Patent 9,784,432, "Optical assembly with form-analogous optics for translucent luminaire"
13. United States Patent 9,880,417, "Illumination Lens for LED Backlights"
14. United States Patent 10,488,000, "Thin Profile Surface Mount Lighting Apparatus"
15. United States Patent 11,047,538, "LED lighting apparatus with adapter bracket for a junction box."

Principal Publications & Presentations

"A New Passive Daylight Delivery System," Masters Thesis, University of Colorado, 1991.

"A Passive Daylight Collection and Delivery System Using Light Guides," presented at IESNA Annual Conference 1992, San Diego, CA.

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"Daylight Calculations, Measurements and Visualization in Non-Empty Rooms," presented at the CIE Seminar on Computer Programs for Light and Lighting, 1992, Vienna, Austria.

"Daylight Calculations, Measurements and Visualization in Non-Empty Rooms," presented and published at Lux Europa 1993, Edinburgh, Scotland.

"Computer Aided Lighting Design - Current & Future Software," presented at the Industrial Technology & Research Institute, 1996, Hsinchu, Taiwan.

"Guide to selecting the appropriate type of light source model," Proceedings of the SPIE's 47th Annual Meeting, Seattle, WA, 2002

"A Step Toward a Complete and Objective Validation Methodology for Lighting Simulation Tools," 25th Session of the CIE, San Diego, CA, 2003

"Test Cases to Assess the Accuracy of Lighting Computer Programs," CIE TC 3.33 Technical Report, 2005

"Lighting Simulation Software, Accuracy and Utility," Albuquerque IES Chapter meeting, February 2006

"LED Source Modeling Method Evaluations," LED professional Review, November / December 2008, p34

"LED Source Models," LED Journal, January / February 2009, p17

"Ocena Metod Modelowania Zrodela LED," Swietlenie LED, January 2011, p11

"Digital Tools for Designing Optics," May 15th, 2011, Lightfair, Philadelphia, PA

"Photopia & LED Workshop," IES Mexico Chapter, Lighting Journey 2011," June 1st, 2011, Mexico City, Mexico

"Photometry, Optical Design & Lab Session," instructor at the Rocky Mountain Lighting Academy, June 2013, Boulder, CO

"Photometry, Color Metrics, Optical Design & Lab Session," instructor at the Rocky Mountain Lighting Academy, June 2014, Boulder, CO

"HDR Imaging Based BRDF/BTDF Measurements," Council for Optical Radiation Measurements (CORM) 2015 Annual Technical Conference, May 14th, 2015, University of Colorado, Boulder, CO

"Photometry, Optical Design & Lab Session," instructor at the Rocky Mountain Lighting Academy, June 2015, Boulder, CO

"Optics & Luminaires," seminar presented as an educational offering from the Rocky Mountain Section of the IES, February 2016, Denver, CO

"Photometry, Optical Design & Lab Session," instructor at the Rocky Mountain Lighting Academy, June 2016, Boulder, CO

"Freeform Optic Design Method with Multiple 2D Profiles: Type III Roadway Lens Example," coauthored with Meg Tidd, International Optical Design Conference 2017, Optical Society of America, Denver, Colorado, United States, 9-13 July 2017



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"Photometry, Optical Design & Lab Session," instructor at the Rocky Mountain Lighting Academy, September 2017, Boulder, CO

"Ray Tracing for Fluence Rate Simulations in Ultraviolet Photoreactors," coauthored with Yousra M. Ahmed, Mengkai Li, and Ernest R. Blatchley III, Environmental Science + Technology, DOI 10.1021/acs.est.7b06250, 4/2018

"Photometry, Optical Design & Lab Session," instructor at the Rocky Mountain Lighting Academy, June 2018, Boulder, CO

"Photometric File Representation for Non-Standard Luminaire Shapes," coauthored with Meg Tidd, LTI Optics white paper, February 2019

"Illumination Optics for Solid State Lighting," Education and Training in Optics and Photonics (ETOP), May 2019, Quebec City, Canada

"Photometry, Optical Design & Lab Session," instructor at the Rocky Mountain Lighting Academy, June 2019, Boulder, CO

"Quantifying Luminaire Performance," IES Educational Webinar Series, August 2019

"Characterizing Full BSDF Data for Light Guide Extraction Features," coauthored with Meg Tidd, LTI Optics white paper, January 2021

"Graduate Certificate in Architectural Lighting – Capstone Class in Optics & Photometry," instructor at the University of Colorado, July 2021, Boulder, CO