OUTLINE OF EXPERTISE

- Internationally recognized expert in the field of lighting, LEDs and light sources, optical and illumination engineering.
- Highly experienced with government relations, regulations, and specifications.
- Leader and major contributor for the LED and lighting industry standards development.
- Many years of leadership experience in major corporations for managing engineering, research, technology development, product design, testing, standards, compliance, technology and business strategies, intellectual property, academic and governmental interfaces.
- High technical skills in optical, electrical, mechanical engineering and computer applications, specializing in lighting and LED product design and development.
- Excellent communication and teaching skills.
- Experienced expert witness, technical and business consultant for lighting and LED related civil and intellectual property litigations, technology strategies, and financial investments.

EMPLOYMENT EXPERIENCE

09/2015 – Present San Francisco, CA

Consultant – JZJ Consulting, Inc.

Consultation for industry, government agencies, academia, and professional associations in the areas of LEDs, lasers, and lighting. Examples of recent projects:

- U.S. EPA Energy Star Lighting Program compliance.
- U.S. DOE Solid-State Lighting R&D project reviews.
- Laser headlamp and ADB technology development for a government sponsored project.
- Technology scouting, design review, and standard development for automotive OEMs, automotive lighting (tier-one) suppliers, and major LED manufacturers.
- Testing and evaluation standards compliance for photometry instruments manufacturers.
- Product compliance review for lighting manufacturers on behalf of the independent test labs.
- M&A strategies for automotive lighting (tier-one) suppliers.
- NIST Assessor for NVLAP accredited laboratories.
- Expert witness for IP disputes and litigations.

06/2007 – 09/2015 Sunnyvale, CA

Director – Regulations and Emerging Technologies, OSRAM Opto Semiconductors Inc. (www.osram-os.com, OSRAM Opto is one of the world-wide largest LED

companies, a subsidiary of OSRAM GmbH).

Responsibilities and Major Accomplishments:

- Functioned as company's NAFTA liaison for technology scouting and monitoring in industry, academics, and startups.
- Interfaced with academic and industrial consortium programs to present the company's positions and to collaborate product and technology development strategies with LED, laser, sensor, and lighting industry.
- Managed LED and lighting regulations and standards activities.
- As the company's representative, interfaced with U.S. governmental agencies such as U.S. DOE, DOT, EPA, and DOC, as well as state level authorities such as CEC, etc.
- Interfaced and participated in the U.S. professional, standard and trade organizations such as ANSI, SAE, IESNA, NEMA, UL, IEEE, JEDEC, SEMI, ASABE, CIE-USA, etc. to establish and revise industry standards relating to LEDs and lasers.
- Established strategies for the emerging technologies for LED and laser applications.
- Established company-wide system to integrate standard and regulation requirements into product development and quality management; transferred the engineering mentality and awareness from a high-tech semiconductors basis to lighting commodities; strategically placed the company's position in the standardization bodies.
- Managed the LED technology strategies and implementations in the fields of automotive, general illumination, horticulture, display, medical, defense, and others in the NAFTA market.

08/1993 – 06/2007 Farmington Hills, MI

General Manager (Previously Manager up to 10/1998) – Engineering Technology, North American Lighting, Inc. (www.nal.com, a primary and the largest automotive lighting supplier in North American and an affiliation of Koito www.koito.co.jp, the world-wide largest automotive lighting company).

Responsibilities and Major Accomplishments:

- Provided strategic planning for new technology implementation and new business development
- Established from ground zero and managed world-class engineering team consisting of four departments: Optical Design, Electronic Technologies, Engineering Analysis, and Regulation and Standards
- Assisted the company to grow and expand the US customer base and revenue from $100 million to a half billion, and made the company the largest US automotive lighting supplier.
- Investigated, identified and negotiated technology transfer and technology exchange with the foreign shareholder companies.
- Managed intellectual property protection including patent applications

09/1989 – 08/1993 Troy, MI & Anderson, IN

Sr. Development Engineer & Project Manager – Advanced Development in Lighting, General Motors Corporation, IFG Division.

- Participated in and managed R&D projects in technology development to implement state-of-the-art technologies in automotive lighting applications.
- Led technology development projects including holograms, optical waveguides and light guides, fiber optics, non-imaging optics, computer-aided optical design, thermal analysis, LED, HID, neon and other new light source applications in the automotive lighting systems.

PROFESSIONAL EXPERIENCE – ACADEMIC/INDUSTRIAL

07/2019 – Present

Technology Advisory Board Member – Lucidity Lights, Inc.

To provide the company guidance with respect to its corporate, research and product development and marketing activities; to assist the company in the development and sale of commercial lighting products.

2007 – Present

Technical Advisory Penal Member – Strategies in Light

To provide technical advices for topics, paper reviews, and speaker invitations for Strategies in Light Conference.

01/2010 – 12/2018

Industry Advisory Board Member – Lighting Enabled System & Applications (LESA, formally Smart Lighting) Engineering Research Center (ERC)

> The ERC was created in 2008 at Rensselaer Polytechnic Institute (RPI). Funded by the National Science Foundation and the State of New York, RPI works with core partners, Boston University and the University of New Mexico to investigate and develop light-emitting diode (LED) technologies that will one day change the way we illuminate our world. The ERC is a superb example of how academia, federal and state governments, and industry can work together to advance the state of science and engineering while creating new opportunities for students, faculty, and businesses.

03/2003 – Present

Instructor – Professional Seminars, SAE Continuing Education Programs.

Taught three college credited short courses both publicly and customer in-house:

- SAE Seminar C0202, "*Automotive Lighting I – Design & Technology*": Lighting fundamentals, design principles and new technologies, 2-days course.
- SAE Seminar C0618, "*Automotive Lighting II – Testing & Requirement*": Automotive lighting definitions, terminologies, testing, and requirements, 1-day course.
- SAE Seminar C0727, "*Automotive Lighting III – LED Application*": LED basics, LED measurements and standardization, LED automotive exterior and interior lighting design strategies and concepts, 1-day course.

01/2009 – 2012

Instructor – Short Course, SPIE – Society of International Optical Engineers.

Teaching college credited short course SC958 "*LED & Solid-State Lighting Standardization and Metrology*".

05/2011 – Present

Instructor – Workshop, Strategies in Light

Teaching workshop "*LED & LED Lighting Standards and Methods of Measurements*".

05/2010 – Present

Instructor – Short Course and Workshop, Light Fair International

Teaching college credited short courses "*LED & Solid-State Lighting Standardization" and "Methods of Measurements for LEDs*".

09/1992 – 06/1997 Southfield, MI

Faculty (Adjunct) – Department of Physics and Department of Electrical Engineering, Lawrence Technological University.

Taught undergraduate courses: non-calculus based and calculus based college physics including instructing laboratory experiments; taught undergraduate course: optical engineering.

09/1990 – 06/1992 Anderson, IN

Faculty (Adjunct) – Department of Physics, Purdue University Anderson Campus.

Taught undergraduate courses: Physical Sciences including instructing laboratory experiments.

01/1985 – 09/1989 Evanston, IL & Troy, NY

Teaching Assistant/Research Assistant – Department of Electrical Engineering and Computer Science, Northwestern University, Evanston, IL; Department of Physics, Rensselaer Polytechnic Institute.

Assisted undergraduate courses in physics and electrical engineering, instructed laboratory courses, conducted problem solving sessions, graded homework and exams.

07/1983 – 12/1984 Beijing, China

Assistant Professor – Department of Applied Physics, Beijing Institute of Posts and Telecommunications.

Taught undergraduate courses: physical optics, modern optics including laboratory experiments.

EXPERT WITNESS EXPERIENCE

Experienced expert witness for litigations and IP disputes including inter parties review process for:

1. U.S. ITC Investigation No. 337-TA-1213, Certain Light-Emitting Diode Products, Fixtures, and Components Thereof.
2. U.S. ITC Investigation No. 337-TA-1195, Certain Electronic Candle Products, and Components Thereof.
3. Case No. IPR2020-01456, U.S. Patent 7,781,789, General Electric Company.
4. Case No. IPR2020-01457, U.S. Patent 9,240,529, General Electric Company.
5. Case No. IPR2020-01458, U.S. Patent 9,859,464, General Electric Company.
6. Case No. IPR2020-01459, U.S. Patent 10,217,916, General Electric Company.
7. Case No. CV 19-4047-PSG, Jiaxing Super Lighting Electric Appliance Co. Ltd. v. MaxLite, Inc.
8. Case No. IPR2020-00162, U.S. Patent 9,897,265, MaxLite, Inc. et al. v. Jiaxing Super Lighting Electric Appliance Co. Ltd. et al.
9. Case No. 3:19-cv-797, CHM Industries, Inc. dba Carolina High Mast v. Tristar Inc.
10. U.S. ITC Investigation No. 337-TA-3385, Light-Emitting Diode Products, Systems, and Components Thereof.
11. Case No. 2:18-cv-05664, Kuen Hwa Traffic Industrial Co. v. DNA Motor, Inc.
12. Case No. BC711451, Capital Lighting & Electric Supply of South Bay, Inc., Deco Enterprises, Inc. v. Envision LED Lighting, Inc.

13. Case No. RIC1406194, Viribright Lighting. Inc. v. VLB Lighting, Riverside County Superior Court.
14. U.S. ITC Investigation No. 337-TA-1107, Fraen Corporation Concerning Certain LED Lighting Devices and Components Thereof.
15. Case No. IPR2018-01309, U.S. Patent 6,547,394, Haag-Streit AG v. Eidolon Optical, LLC.
16. Case No. IPR2018-01311, U.S. Patent 6,547,394, Haag-Streit AG v. Eidolon Optical, LLC.
17. Case No. 3:17-CV-00792-JAM, Light Sources, Inc. v. First Light Technologies, Inc.
18. Case No. IPR2017- 01260, U.S. Patent 6,831,303, Cree Inc. v. Optolum Inc.
19. Case No. IPR2017- 01261, U.S. Patent 7,242,028, Cree Inc. v. Optolum Inc.
20. Case No. IPR2017- 01511, U.S. Patent 7,242,028, Cree Inc. v. Optolum Inc.
21. Case No. 2:13-CV-06383-JD, Dorman Products, Inc. vs. Paccar Inc.
22. Case No. CV12-CV-229, Arthur Wolf vs. Indian Motor Company, Polaris Industries Inc., and Paul Burger, D/B/A Burger Enterprises.
23. Case No. CV08-07078 DDP (VBKx), Grand General Accessories Manufacturing, Inc., vs. United Pacific Industries.
24. Case No. 1:09-CV-07151-RJS, Carlos Collado, Richard Hock, Bill Urban, Enrique Cantu, Paul Bigbie, William Askew, Jacek Pawlowicz, and James Freeman, on behalf of themselves and all others similarly situated vs. Toyota Motor Sales, U.S.A., Inc.
25. Case No. 2:10-CV-03113-R-RMC, Carlos Collado, on behalf of himself and all others similarly situated vs. Toyota Motor Sales, U.S.A., Inc.

INDUSTRIAL & PROFESSIONAL SOCIETY LEADERSHIP

2004 – Present

Active Member and Leader – US professional associations, trade associations and standardization organizations that are developing LED and LED lighting standards include:

- **Chair** (2015 – 2018), ASABE Plant Growth LED Lighting Committee
- **Chair** (2008 – 2011), **Vice Chair** (2004 – 2008), SAE Lighting Standard Committee
- **Vice Chair** (2009 – 2015), ANSI TC78 WG09 SSL Light Source Committee
- **Treasurer** (2012 – 2020), IES Testing Procedures Committee
- **Vice Chair** (2016 – Present), IES Light Source Committee
- **Chair** (2020 – Present), **Vice Chair** (2014 – 2020), IES Computer Committee
- **Chair** (2007 – 2009), NEMA Lighting Division, SSL Section Technical Committee
- **Chair** (2008 – 2009), Next Generation Lighting Industry Alliance (NGLIA)
- Member, ASABE Energy System Oversight Committee
- Member, ANSI TC82 WG04 SSL Driver Committee
- Member, IES Roadway Lighting Committee
- Member, CIE TC2-76, AC LED Characterization Working Group

- Member, UL8750 LED Source Safety Standard Technical Penal
- Member, UL8800 Horticultural Lighting Safety Standard Technical Penal
- Member, IEEE PAR 1789 LED Flicker Health Hazards Committee
- Member, JEDEC C-15 LED Thermal Measurement Committee

1994 – Present

Lead, Major Contributor, or Working Group Member – Newly established LED lighting standards include:

- ANSI/ASABE S642 SEPT2018, *Recommended Methods for Measurement and Testing of LED Products for Plant Growth and Development*
- ANSI/ASABE S640 JUL2017, *Quantities and Units of Electromagnetic Radiation for Plants (Photosynthetic Organisms)*
- ANSI C78.377-2017, *Specifications for the Chromaticity of Solid-State Lighting Products*
- ANSI C78.374-2015, *LED Specification Sheet*
- ANSI/IES LM-79-19, *Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products*
- ANSI/IES LM-80-20, *Approved Method for Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules*
- ANSI/IES TM-21-21, *Projecting Long Term Lumen Maintenance of LED Light Sources*
- ANSI/IES LM-82-20, *Approved Method for the Characterization of LED Light Engines and LED Lamps for Electrical and Photometric Properties as a Function of Temperature*
- ANSI/IES LM-84-20, *Approved Method for Measuring Lumen Maintenance of LED Lamps, Light Engines, and Luminaires*
- ANSI/IES TM-28-20, *Projecting Long Term Lumen Maintenance of LED Lamps and Luminaires*
- ANSI/IES LM-85-20, *Approved Method for the Electrical and Photometric Measurements of High-Power LEDs*
- ANSI/IES TM-25-20, *Ray File Format for the Description of the Emission Property of Light Sources*
- ANSI/IES TM-27-20, *IES Standard Format for the Electronic Transfer of Spectral Data*
- ANSI/IES TM-26-20, *Projection of LED Package Failure Rate*
- ANSI/IES LM-86-20, *Approved Method for Measuring Luminous Flux and Color Maintenance of Remote Phosphor Components*
- ANSI/IES LM-88-20, *Approved Method: Optical and Electrical Measurements of AC-LED Packages and Arrays or Modules*
- ANSI/IES LM-90-20, *IES Method of Measuring Optical Waveforms for use in Temporal Light Artifact (TLA) Calculations*
- ANSI/IES LM-91-21, *Approved Method: Application Distance Radiometry*
- UL8750, *LED Equipment for Use in Lighting Products*
- NEMA SSL-1, *Electronic Drivers for LED Device, Arrays, or Systems*
- NEMA SSL-3, *High Power White LED Binning for General Illumination*

- NEMA SSL-4, *SSL Retrofit Lamps: Suggested Minimum Performance Requirements*
- SEMI 5265A, *Specifications for Sapphire Wafers Intended for Use for Manufacturing High Brightness Light-Emitting Diode Devices*
- JESD51-51, *Implementation of the Electrical Test Method for the Measurement of Real Thermal Resistance and Impedance of Light-Emitting Diodes with Exposed Cooling*
- SAE J1889, *LED Signal and Marking Lighting Devices*
- SAE J2650, *Performance Requirements for Light Emitting Diode Road Illumination Devices*
- SAE J2938, *LED Light Sources Tests and Requirements Standard Part 2: LED Lumen and Color Maintenance Measurements*
- SAE J3014, *Highly Accelerated Failure Test (HAFT) for Automotive Lamps with LED Assembly*

1996 – Present Detroit, MI

Organizer & Chairman – SAE World Congress, Lighting Technology Conference

Organize the largest international automotive lighting technology annual events, review technical papers and presentations, invite speakers on selected topics, establish conference programs, chair the conferences, and edit proceedings.

2008 – 2018 San Diego, CA

Conference Organizer and Session Chairman – SPIE Optics + Photonics, International Conference on Solid-State Lighting, and LED-Based Illumination Systems

Participation in organizing one of the largest international conferences on LEDs and SSL, review topics, invite speakers, establish conference programs, and chair the conferences.

1996 – 2013

Organizer – SAE Lighting Forum

Organize and facilitate Forum for education and information exchange of the topics of:

- LEDs: The Latest and Greatest
- Safety: Vehicular Lighting and Roadway Lighting
- IR and Night Vision Technologies
- LED Technology Update
- Glare, Human Factor's Perspectives
- Color & CRI
- Intelligent Lighting Systems

Jianzhong Jiao, Ph.D.
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EDUCATION

1985 – 89 **Ph.D. in Electrical Engineering**, Northwestern University, (GPA 4.0/4.0), Evanston, IL
1985 Graduate Studies (Ph.D. Program) in Physics, Rensselaer Polytechnic Institute, (GPA 4.0/4.0), Troy, NY
1980 – 83 **M.S. in Applied Physics**, Beijing Institute of Posts and Telecommunications, Beijing, China
1976 – 80 **B.S. in Mechanical Engineering**, Beijing Polytechnic University, Beijing, China

PROFESSIONAL TRAINING

08/2015 **Change Leadership,** Cornell University eCornell. Identify opportunities for change, negotiate support, and implement the initiatives. Ensure successful implementation by managing conflict, organizing resources, motivating and directing, and developing political and organizational agility.
09/2009 **Photometry Short Course**, National Institute of Standard Technology, US DOC.
05/2007 **Leadership Beyond Management**, University of Wisconsin Business School, a comprehensive executive training program focused on emotional intelligence in a leadership role.
05/1995 **Executive Communication**, University of Michigan Business School, an intensive and comprehensive training program taught by dedicated well- known professors specializing in communications.
1990 – 05 Management Training Courses & Seminars:

- Fundamentals of Accounting and Budgeting
- How to Effectively Work with Japanese
- Negotiation Skills
- Business Writing for Results
- Management Skills for New Technical Managers and Supervisors
- Program Management; Lead-Time Reduction; Problem Solving
- Quality Function Deployment (QFD)
- System of Experimental Design (Taguchi Method)

U.S. PATENTS

1. "Self-Aim Vehicle Light Device", U.S. Patent No. 7,144,141
2. "Apparatus and Method for Providing a Modular Vehicle Light Device", U.S. Patent No. 7,059,754
3. "Reflector Apparatus for a Tubular Light Source" U.S. Patent No. 6,953,261
4. "Vehicle Fog Lamp", U.S. Patent No. D503,004
5. "Light Coupler Hingdely Attached to a Light Guide for Automotive Lighting", U.S. Patent No. 6,623,132.
6. "Display Device Using a Light Guide for Exterior Automotive Lighting", U.S.

Patent No. 6,305,813.
7. "Automotive Headlamp Reflector and Method for Its Design", U.S. Patent No. 6,007,224.
8. "Fiber Optic Light Coupler", U.S. Patent No. 5,390,265
9. "Illuminator Device for a Display Panel", U.S. Patent No. 197,792

BOOKS

1. Editor: "*Automotive Lighting Technology and Human Factors in Driver Vision and Lighting*", Published by SAE SP2300, April 2011
2. Editor: "*Automotive Lighting Technology and Human Factors in Driver Vision and Lighting*", Published by SAE SP2266, April 2010
3. Editor: "*Automotive Lighting Technology*", Published by SAE SP-2223, April 2009
4. Editor: "*Automotive Lighting Technology*", Published by SAE SP-2149, April 2008
5. Editor: "*Automotive Lighting Technology and Human Factors in Driver Vision and Lighting*", Published by SAE SP-2106, April 2007
6. Editor: "Automotive *Lighting Technology and Human Factors in Driver Vision & Lighting; Rear Vision & Indirect Vision*", Published by SAE SP-1993, April 2006
7. Editor: "*Lighting Technology and Human Factors*", Published by SAE SP-1932, April 2005
8. Editor: "*Lighting*", Published by SAE SP-1875, March 2004
9. Editor: "*Lighting Technology*", Published by SAE SP-1787, March 2003
10. Editor: "*Advanced Lighting Technologies for Vehicles*", Published by SAE SP-1668, March 2002
11. Editor: "*Lighting Technology Development for Automobiles*", Published by SAE SP-1595, March 2001
12. Editor: "*Automotive Lighting Research*", Published by SAE SP-1531, March 2000
13. Editor: "*Advances in Automotive Lighting Technologies*", Published by SAE SP-1424, March 1999
14. Editor: "*Automotive Lighting Technology*", Published by SAE SP-1323, March 1998
15. Editor: "*New Concepts in Automotive Lighting Technology*", Published by SAE SP-1249, March 1887

TECHNICAL PAPERS & ARTICLES

1. "Major Contributors in LED and Lighting Standards Have LED and SSL Revolution", *LED Magazine*, February 2018.
2. "Work Continues on Three LED Lighting Reliability Standards", *LED Magazine*, May 2017.
3. "Work Continues on Three LED Lighting Reliability Standards", *LED Magazine*, May 2017.
4. "SAE Adds New Standards for LED-Based Automotive Lighting", *LED Magazine*, February 2017.
5. "ASABE Committee Continue Work on LED Horticultural Lighting Standards",

LED Magazine, November 2016.

6. "Industry Progresses on Testing Standard for AC-driven LEDs", *LED Magazine*, February 2016.
7. "ANSI Continues Advancements on SSL Chromaticity Standard", *LED Magazine*, December 2015.
8. "IES Explores Projection Method Developments Using LM-80 Data", *LED Magazine*, September 2015.
9. "Stakeholders Make Progress on LED Lighting Horticulture Standards", *LED Magazine*, June 2015.
10. "Illuminating Engineering Society Updates LED Testing Standards", *LED Magazine*, April 2015.
11. "ANSI Works to Update the SSL Chromaticity Standard", *LED Magazine*, February 2015.
12. "IES Establishes New Standard for Spectral Data Transfer", *LED Magazine*, December 2014.
13. "LED Automotive Lighting Applications Require Unique SAE Standards", *LED Magazine*, September 2014.
14. "ANSI Recognizes Need for LED Drive Testing Standard", *LED Magazine*, June 2014.
15. "IES LM-85 Homogenizes High-Power LED Measurement and Characterization", *LED Magazine*, February 2014.
16. "IES TPC Considers LM Standard for Remote Phosphor Optics", *LED Magazine*, December 2013.
17. "IES Moves to Establish LED Light Source Ray File Standard", *LED Magazine*, July 2013.
18. "New Standards Will Enable Lumen Maintenance Projection for SSL", *LED Magazine*, April 2013.
19. "ANSI Works to Standardize LED Datasheet for White LEDs", *LED Magazine*, February 2013.
20. "SEMI Committee Progresses in HB LED Process Standards", *LED Magazine*, October 2012.
21. "Standards Emerge for Thermal Characterization of LEDs", *LED Magazine*, September 2012.
22. "JEDEC Test Standards and LED Package Reliability", *LED Magazine*, April 2012.
23. "Testing LEDs for Automotive Lighting Applications", SAE World Congress, Detroit, MI, April 2012.
24. "Lumen Maintenance Testing for LED Lamps, Light Engines, and Luminaires", *LED Magazine*, February 2012.
25. "A Method for Projecting Lumen Maintenance of LED light Sources", IES Annual Conference, Austin, TX, November 2011.
26. "Understand the Difference between LED Rated Life and LED Lumen Maintenance Life", *LED Magazine*, October 2011.
27. "ANSI Evaluates Revisions to SSL Chromaticity Standard", *LED Magazine*, August 2011.
28. "LED Safety Standard UL8750 Requires Further Clarification", *LED*

Magazine, April 2011.

29. "TM-21 Seeks Methods for Lumen Maintenance Prediction", *LED Magazine*, February 2011.
30. "Non-Directional Luminaires Require New Testing Procedures for LED Light Engines", *LED Magazine*, December 2010.
31. "LED Lighting Community Benefits from Ongoing Standardization Efforts", *LED Magazine*, April 2010.
32. "Standardization for Light Emitting Diodes and Solid-State Lighting", *LED Journal*, August/September 2009.
33. "High-Efficiency Reflector Optics for LED Forward Lighting", *SPIE Proceedings Vol. 6670*, September 2007.
34. "Optical Transform Limitations in Headlamp Photometric Performance", *SAE Technical Paper Series 2005-01-0861*, April 2005.
35. "Studies for Headlamp Optical Design Using LEDs", *SAE Technical Paper Series 2004-01-0434*, March 2004.
36. "Etendue Concern for Automotive Headlamp Using LEDs", *SPIE Proceedings Vol. 5187*, January 2004.
37. "Temperature Predictions Using Thermal Database and Design Sensitivity Analysis", *SAE Technical Paper Series 1999-01-0699*, March 1999.
38. "Environment Leading to Condensation in Automotive Lamps", *SAE Technical Paper Series 980316*, February 1998.
39. "Study of Tubular Volume Light Source Intensity Distribution", *SAE Technical Paper Series 980320*, February. 1998.
40. "Mechanisms of Water Ingress in Automotive Lamps", *Progress in Automotive Lighting (PAL) Symposium Proceedings,* September 1997.
41. "Design Strategy for Free-Form Reflector Head Lamp Using High Intensity Discharge Light Source", *SAE Technical Paper Series 970092*, February 1997.
42. "High Performance Fog Lamps: Design Strategies and Proper Usage", *SAE Technical Paper Series 960928*, February 1996.
43. "Low Beam Head Lamp Design Using Distributive Lighting System", *SAE Technical Paper Series 960489*, February 1996.
44. "Automotive Head Lamp Beam Pattern Uniformity Evaluation", *SAE Technical Paper Series 960789*, February 1996.
45. "Quantitative Evaluation of the Uniformity for an Automotive Head Lamp Beam Pattern", *SPIE Proceedings Vol. 2622*, August 1995, also on *Progress in Automotive Lighting (PAL) Symposium Proceedings,* September 1995.
46. "Intelligent Vehicle Lighting", Convergence, Dearborn, MI, October 1994.
47. "Relief Holograms on an Optical Waveguide Using Embossing or Injection Molding", OSA Annual Meeting, Albuquerque, NM, September 1992.
48. "Fiber Optic Application in Automotive Lighting system", (GM) Engineering Technology Conference, Warren, MI, June 1991.
49. "Recent Developments on Holography in China", *SPIE Proceedings Vol. 1238*, February 1991.
50. "Holographic Technology in Automobile Lighting System", (GM) Product Engineering Technology Conference, Warren, MI, May 1990.
51. "Boundary Layer Analysis of Infrared Whispering-Gallery Waveguides", *SIAM*

Journal on Applied Mathematics Vol. 50, No. 2, 1990.

52. "Transverse Magnetic Loss in a Uniformly Bent Metallic Waveguide at 10.6m", *Applied Optics, Vol. 29, No. 18*, 1990.
53. "Losses of Infrared Biconcave Metallic Whispering-Gallery Waveguides", *Infrared Physics, Vol. 29 No. 213*, 1989.
54. "Losses for Vector Solutions of Infrared Whispering-Gallery Waveguides", Society of Industrial and Applied Mathematics Annual Meeting, Minneapolis, Minnesota, July 1988
55. "Wigner Distribution Function and Optical Geometrical Transformation", *Applied Optics, Vol. 23, No .8*, 1984

INVITED SPEECHES & PRESENTATIONS

1. "Solid-State Light Sources and Light Measurements in Automotive Lighting", CORM / CIE US & Canadian National Committees Joint Conference, November 2021.
2. "Importance of LED Lighting Standards and Regulations", Light Fair International, Philadelphia PA, October 2021.
3. "LED Lighting Standards and Methods of Measurements", Strategies in Lights, San Diego CA, February 2020.
4. "Optical Design Considerations for Automotive Lighting", Advanced Lighting for Automotive Summit, Detroit MI, May 2019.
5. "LED Automotive Lighting Standard Development in the U.S.", Advanced Lighting for Automotive Summit, Detroit MI, May 2019.
6. "LED Lighting Methods of Measurements", Light Fair International, Philadelphia PA, May 2019.
7. "LED Lighting Standards and Methods of Measurements", Strategies in Lights, Las Vegas NV, February 2019.
8. "U.S. LED Lighting Standards and Updates", Light Fair International, Chicago IL, May 2018.
9. "LED Lighting Standards and Methods of Measurements", Strategies in Lights, Long Beach CA, February 2018.
10. "Establishing Standards for Horticultural Lighting – Enabling Optimal Utility Incentive Programs", EUCI Conference, San Francisco CA, October 2017.
11. "Methods of Measurements for LEDs and LED Lighting", Light Fair International, Philadelphia PA, May 2017.
12. "LED Lighting Standards and Methods of Measurements", Strategies in Lights, Anaheim CA, February 2017.
13. "LED Lighting Standards and Methods of Measurements", Strategies in Lights, Santa Clara CA, February 2016.
14. "Methods of Measurements for LEDs and LED Lighting", Light Fair International, New York NY, May 2015.
15. "LED Lighting Standards and Methods of Measurements", Strategies in Lights, Les Vegas NV, February 2015.
16. "Methods of Measurements for LEDs and LED Lighting", Light Fair International, Les Vegas NV, June 2014.

17. "LED Lighting Standardization in the U.S.", CIE 2014 Lighting Quality & Energy Efficiency, Kuala Lumpur, Malaysia, April 2014.
18. "LED Lighting Standards and Methods of Measurements", Strategies in Lights, Santa Clara CA, February 2014.
19. "LED & Solid-State Lighting Standards in the U.S.", LEDs Magazine Webcast, September 2013.
20. "LED Automotive Lighting Standards Development in SAE", First International Forum on Automotive Lighting, Kunshan, China, June 2013.
21. "LED Lighting Standards and Methods of Measurements", Strategies in Lights, Santa Clara CA, February 2013.
22. "LED & Solid-State Lighting Standards and Metrology", SPIE Photonics West, San Francisco CA, February 2013.
23. "LED and Solid-State Lighting Standardization in U.S.", LED Korea 2013 Conference, Seoul, Korea, January 2013.
24. "The Latest in LED Lighting Test Methods and Standards", The US EPA Energy Star Partner Meeting, St. Paul MN, October 2012.
25. "LED Standards and Measurement Methods", Light Fair International, Les Vegas NV, May 2012.
26. "Updates for LED and SSL Standards", Strategies in Lights, Santa Clara CA, February 2012.
27. "New LED Lighting Standards", ArchLED 2011, Chicago, IL, November 2011.
28. "LED Lighting Standards in ENERGY STAR® Programs", The U.S. EPA Energy Star Partner Meeting, Charlotte NC, November 2011.
29. "LED Lighting Standardization Overview", SPIE Optics + Photonics, Eleventh International Conference on Solid State Lighting, San Diego CA, August 2011.
30. "LED Lighting Standardization", Light Fair International, Philadelphia PA, May 2011.
31. "LED Lighting Standardization Overview", Strategies in Lights China, Hong Kong, China, May 2011.
32. "LED Lighting Standardization Overview", Strategies in Lights, Santa Clara CA, February 2011.
33. "LED Lighting Standardization in the U.S. Overview", Strategies in Lights Japan, Yokohama, Japan, October 2010.
34. "LED & Solid-State Lighting Standardization", Light Fair International, Les Vegas NV, May 2010.
35. "LED Lighting Standardization Updates", ArchLED 2010, Chicago IL, June 2010.
36. "Update on Standards for LED Lighting", Strategies in Lights, Santa Clara CA, February 2010.
37. "Standards for LED Testing", Solid-State Lighting and Testing Forum, Taipei, Taiwan, December 2009.
38. "LED & Solid-State Lighting Standardization", SSL Design Summit, New York NY, November 2009.
39. "LED & Solid-State Lighting Standardization in NEMA", LEDs 2009 (by Intertech Pira), San Diego CA, October 2009.
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41. "High power InGaN LEDs", The Electrochemical Society 215th Meeting, San Francisco CA, May 2009.
42. "Overview of U.S. LED & SSL Standards", Strategies in Lights, Santa Clara CA, February 2009.
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44. "Commercialization of Solid-State Lighting: Standardization", Energy Efficiency and Sustainability Symposium, Atlanta GA, November 2008.
45. "US LED & SSL Regulation & Standard Activities", The Fifth China Solid-State Lighting Forum, Shenzhen, China, July 2008.
46. "World-Wide LED Forward Lighting Applications", First International Conference on White LEDs and Solid-State Lighting, Tokyo, Japan, November 2007.
47. "New Optical Configurations and System Integrations in LED Forward Lighting Applications", The Forth China Solid-State Lighting Forum, Shanghai, China, August 2007.
48. "LED Automotive Lighting in the U.S.", The Third China Solid-State Lighting Forum, Shenzhen, China, July 2006.
49. "LED Automotive Lighting Applications in USA", The Forth International Workshop on Industrial Technologies for Optoelectronic Semiconductor, Gwangju, South Korea, December 2005.
50. "LED Sources in Automotive Exterior Lighting Applications", International Forum on Light Sources for Traffic and Transportation, Wuxi, China, May 2005.
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53. "Automotive Lamp Designs Using LEDs as Light Sources", SPIE 49th Annual Conference, Denver, CO, August 2004.
54. "What is a Good Headlamp", DOT National Highway Transportation Safety Administration (NHTSA) Workshop, Washington DC, July 2004.
55. "US Automotive Lighting Overview – Competition, Trend, & New Technologies", International Automotive Electronic Technology Development & Application Forum, Shanghai, China, November 2003.
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57. "New Developments in LEDs for Automotive Market", Strategies in Lights, San Mateo CA, February 2003.
58. "An Overview of LEDs in Automotive Lighting", Strategies in Lights Workshop, San Mateo CA, February 2003.
59. "Global Automotive Lighting Technology and Marketing Overview", Invited Lecture, Fu Dan University, Shanghai, China, October 1999.

HONORS & AWARDS

James M. Crawford Executive Standards Committee Outstanding Achievement Award, for recognizing those who make a valuable contribution of time and leadership in support of the SAE technical committees through external representation of the Society and/or contributions to SAE technical committee work in the form of research, test methods and procedures, and/or development of standards, 2022.

Senior Member of SPIE, for recognizing the professional experience, active involvement with the optics community and SPIE, and/or significant performance that sets apart from the peers, elected in 2015.

Arch T. Colwell Cooperative Engineering Medal, for recognizing unique and outstanding contribution over a period of time to the work of the technical committees under the Technical Standards Board in developing standards, specifications, technical reports and data development through cooperative research, 2010.

SAE Fellow, for recognizing and honoring long-term members who have made a significant impact on society's mobility technology through leadership, research, and innovation, elected in 2008.

Technical Standards Board Outstanding Contribution Award, for recognizing individuals for outstanding service in the technical committee activities of the Society, 2008.

Forest R. McFarland Award, for recognizing individuals for their outstanding contributions toward the work of the SAE Engineering Meetings Board in the planning, development, and dissemination of technical information through technical meetings, conferences, and professional development programs or outstanding contributions to the EMB operations in facilitating or enhancing the interchanges of technical information, 2007, and 2000.

Excellence in Oral Presentation Award, SAE 2005 World Congress, 2005.

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