

**Professor and Endowed Chair
Emma & Irving Goldman Scholar
Director, Visual Systems Group
Co-Director, Science of Light Center**

Division of Pediatric Ophthalmology
Division of Developmental Biology
Cincinnati Children's Hospital Research Foundation
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Education

1980-1984 **B. Sc. (Hons), University of Melbourne, Australia**
Co-major in genetics and biochemistry. First Class Honors

1985-1988 **Ph.D., University of Melbourne, Australia**
The Ludwig Institute for Cancer Research under Drs. A. R. Dunn and T. J. Gonda

Postdoctoral Training

1989-1992 **Postdoctoral Fellow, University of California, San Francisco**
The G.W. Hooper Research Foundation under Dr. J. Michael Bishop
Role of the macrophage in scheduled vascular regression.

Academic Appointments

1993-1996 **Assistant Professor, Skirball Institute for Biomolecular Medicine**
Departments of Cell Biology (primary appointment) and Pathology
Skirball Institute for Biomolecular Medicine New York University School of Medicine

1997-2001 **Associate Professor, Skirball Institute for Biomolecular Medicine**
Departments of Cell Biology (primary appointment) and Pathology
Skirball Institute of Biomolecular Medicine, Developmental Genetics Division
New York University School of Medicine

2001 – present **Professor, Cincinnati Children's Hospital Research Foundation**
Endowed Chair, Emma and Irving Goldman Scholar

2001 – present **Director, Visual Systems Group**
Division of Pediatric Ophthalmology and Division of Developmental Biology
Cincinnati Children's Hospital Research Foundation

2001 – present **Professor, Department of Ophthalmology**
University of Cincinnati College of Medicine

2017 – 2019 **Affiliated Faculty, Umeå Centre for Molecular Medicine (UCMM)**
Umeå University, Sweden

2021 – present **Co-Director, Science of Light (SOL) Center**
Pediatric Ophthalmology and the Perinatal Institute
Cincinnati Children's Hospital Research Foundation

2024 - 2026

Guest Professor, Keio University

Department of Ophthalmology, Tokyo, Japan.

Honors and Awards

- 1984 The Roy and Iris Simmons Prize for academic achievement, Melbourne University
- 1985 Commonwealth Postgraduate Research Award
- 1989 C. J. Martin National Health and Medical Research Council Postdoctoral Fellowship
- 1991 Leukemia Society of American Special (Senior) Postdoctoral Fellowship
- 1993 American Cancer Society Institutional Research Grant
- 1993 Elsa U. Pardee Foundation Research Grant
- 1994 Searle Scholar
- 1999 NYU School of Medicine multiple research grant incentive award
- 2000 NYU School of Medicine multiple research grant incentive award
- 2001 NYU School of Medicine multiple research grant incentive award
- 2001 CCHMC Emma & Irving Goldman Scholar Endowed Professorship
- 2006 Pearle Vision Foundation Award
- 2007 Research to Prevent Blindness Lew R. Wasserman Merit Award
- 2009 Scholars in Vision Science Lecture, University of Pittsburgh Medical Center
- 2011 CCHMC Inaugural Mentoring Achievement Award
- 2012 National Eye Institute representative to Forward Focus Workshop:
Strategic Planning for the NIH Common Fund
- 2012 Appointment to National Eye Institute Board of Scientific Counselors
- 2013 National Eye Institute Audacious Goals review panel
- 2013 The Kimura Lecture at the University of California, San Francisco
- 2013 Visiting Professorship, Boston Children's Hospital, Harvard Medical School
- 2014 Sackler Lecturer at the Mortimer and Raymond Sackler Institute of Advanced Studies, Israel
- 2016 The Bergy Lecture, University of Washington, Seattle
- 2019 The David C. Beebe Lecture, Washington University in St Louis
- 2020 Distinguished Speaker Series, University of California Irvine
- 2021 The Rich Lecture, University of Alabama
- 2022 Keynote Lecture, Texas Society for Circadian Biology and Medicine

Administrative Responsibilities and Program Development

2001 – present, Director, Visual Systems Group, CCHMC

The research arm of the Division of Pediatric Ophthalmology at Cincinnati Children's Hospital is known as the Visual Systems Group (VSG). I was responsible for building a faculty group starting in 2001. The primary goal was to generate a first-rate, diverse faculty group with a primary interest in sensory systems. The faculty included Nadean Brown, PhD, and Fumika Hamada, PhD, both of whom made spouse-motivated moves to UC Davis, as well as Zubair Ahmed, who moved to a more senior position at University of Maryland. In 2019, we recruited Veeral Shah, MD, PhD, a neuro-ophthalmologist.

2010 – 2021, Director, Internal Funding, CCHMC

Cincinnati Children's Hospital has established a duo of internal funding vehicles – designated Gap Funding and Research Innovation and Pilot Funding – that are designed to either provide seed money for launching new research projects or maintenance money for continuing existing ones. The program was initiated in 2010 under my guidance. We established a formal process of scientific merit review that distributes \$2.1M each year. In 2021, to create bandwidth for other program development responsibilities, I passed on responsibility for this program to Theresa Alenghat, VDM, PhD and Avani Modi, PhD.

2016: Founder, Center for Circadian Medicine, CCHMC

Cincinnati Children's Hospital Medical Center has a formal process for proposals for program development through the Academic and Research Committee (ARC). In 2016, I applied to the ARC for funding to establish a Center for Circadian Medicine. The proposal argued that the high percentage of genes (10-30%, depending on the study and tissue) that are rhythmically expressed with a circadian pattern implies that most research in biology and therapy will need to take circadian regulation into account. In 2017, John Hogenesch, PhD was recruited to CCHMC using funds provided by the ARC. John currently serves as the Director of the Center for Circadian Medicine and has established an impressive program in translational circadian biology.

2018 - present, Hospital Lighting for Therapy

When it became clear from our research findings that developmental processes could be dependent on light stimulation of opsins, we considered the possibility of using light stimulation for therapy. A unique opportunity to advance this question arose when CCHMC decided to build a new hospital, the Critical Care Building (CCB, rendering at right). A discussion with Jim Greenberg, MD, lead physician for the CCB, resulted in the plan to establish a research grade lighting system in the new hospital. Working with ZGF, the building architects, and the lighting companies BIOS and Acuity we established



a lighting system that gives full control over spectral composition and intensity over time. At the cost of about \$2.4M, this was completed in 54 NICU rooms in November 2021. We intend to use this system to establish circadian lighting (as this is known to be beneficial for premature infants), but also to establish specific protocols that may be beneficial for particular patient groups. For example, since we have shown that Opsin 3 and Opsin 5 both regulate neural development, metabolism and growth, we may be able to help premature infants develop normally with an appropriate full spectrum light stimulation.

2021 – Co-Founder, Science of Light (SOL) Center

Basic discovery work in the Lang lab from 2010 to the present established that mammalian light sensing pathways, both ocular and extraocular, have a role in regulating development, and a fundamentally important role in regulating energy homeostasis. In response to these findings, I proposed that CCHMC establish a Science of Light (SOL) Center that would provide the intellectual and personnel infrastructure to advance this research. Working with Co-Founder James Greenberg, MD, we secured \$2M in funding from the CCHMC Academic and Research Committee. These funds are being used to establish a SOL Center that functions as a multidisciplinary unit promoting basic and clinical research as well as outreach to stakeholders in the design, architecture, engineering, and public health fields.

Teaching Responsibilities

1993 - 2001: Graduate Teaching

While at New York University I taught up to five lectures per year in the Cellular & Molecular Biology and Developmental Genetics graduate courses. I delivered lectures on developmental biology, genetic systems and eye development. The students comprised PhD and MD-PhD enrolled in the Sackler Institute at NYU.

1993 - 2001: Medical Student Courses

At New York University I participated in the teaching of the medical school class in two different formats. First, I team-taught a series of three lectures on the fundamentals of embryology and embryo patterning. This commitment was about 12 contact hours per year. The emphasis of the material was an examination of Hox gene function. The typical class size for these lectures was 120 MD and MD-PhD students. I also participated in small

group teaching of medical students. This typically consisted of 10 students per group with material that connected basic science to a particular disease. Small group teaching occupied about 20 contact hours per year.

2002 - 2010: Graduate Teaching

At Cincinnati Children's Hospital Medical Center I have taught lectures to the PhD and MD-PhD students for the Molecular and Developmental Biology Program. From 2001 to 2007 I taught a two-lecture series on visual system development.

2007 - 2010: Curriculum Director, MDB Program CCHMC

From 2007 to 2010 I served as the Curriculum Director for the Molecular and Developmental Biology Program at Cincinnati Children's Hospital Medical Center. This position covered two courses, Introduction to Developmental Biology and Advanced Developmental Biology. Responsibilities included organization of committee-based decisions about course content, devising the course schedule and quality control measures that included attending lectures and advising the lecturers on content. During this time, I also instituted an exam for the Advanced Developmental Biology course in which students generated a proposal in grant application format and defended the proposal to a Study Section made up of fellow students and faculty. This was valuable in teaching developmental biology content while training students for future interactions with the NIH.

Special Symposia Organized

2005: The Great Lakes and Abrahamson Pediatric Eye Institute Vision Research Conference. With former Ophthalmology Director Dr. Constance West, I organized and hosted a symposium that was part of the Great Lakes Vision Research series. This conference invited clinician-researcher pairs to present on some of the pressing issues in vision research.

2016: CCHMC Symposium on Chronobiology

To help launch the Center for Circadian Medicine, I organized (with John Hogenesch) a symposium that invited many field leaders (see advertising poster at right). The symposium helped to establish CCHMC as a participant in this field and established many important connections between scientists. We plan to hold additional symposia of this type in the future.

2020: CCHMC Symposium for the Myopia Consortium

In January 2020, I organized a small symposium that brought together a group of researchers and clinicians interested in myopia causes and cures. This group will continue to function as a research consortium for basic discovery, translation research and execution of clinical trials.

2022: Symposium on the emerging field of non-visual opsins

Working with Russell Van Gelder, MD PhD (University of Washington), and Kazuo Tsubota, MD, PhD (Tsubota Laboratory, Inc) I organized a symposium of collaborators that was designed to advance the nascent field of the non-visual opsins. This was held at the University of Washington South Lake Union facility and included visitors from Japan, Sweden, and Turkey as well as from a selection of US institutions. The goal was to discuss the latest findings in the field and encourage the establishment of new collaborations.



Training and Mentoring

Summer Students and Master's Degree Students

Over about 25 years I have trained two MS students and many Summer undergraduates under a variety of programs. Many of these students have gone on to successful careers and though there are too many to mention

in detail, there are several notable achievers. These include Srilatha Vuthoori, MS, PMP (Vice President, Moleculin Biotech) and two-time Summer student Fritz Francois who is now the Chief Medical Officer at NYU Grossman Medical Center.

PhD Student Training

Since 1993, I have mentored 13 students for their PhD studies. Of these, six have been MSTP and seven PhD. Of these, three MSTP and one PhD student are currently in the lab. My PhD trainees have gone on to successful careers in science and academia or industry. They include Robert Chow (Associate Professor, University of Victoria), Graciana Diez-Roux (Chief Scientific Officer, Telethon Institute of Genetics and Medicine, Italy), and Sonya Williams-Faber (Head of Clinical Project Management, Bioville). My three completed MSTP trainees include Patricia Dimanlig (Practicing Ophthalmologist), Tony Stefater (Vitreoretinal Surgeon and President, Pykus Therapeutics) and Kevin Zhang (ongoing medical training).

Postdoctoral Fellow Mentoring

Since 1993, I have mentored 30 Postdoctoral fellows. All have gone on to successful careers in academia, industry or patent law. They include Curtis Altmann, PhD, JD (Partner, Arnold and Porter, LLP), Helen Makarenkova, PhD (Associate Professor, Scripps Institute), Ivan Lobov, PhD (deceased, formerly Senior Staff Scientist, Regeneron Pharmaceuticals), Timothy Plageman, PhD (Associate Professor, Ohio State University) and Sujata Rao, PhD (Assistant Professor, Cleveland Clinic). I currently have four Postdoctoral fellows in the lab.

International Teaching Activities

- 2014 Sackler Lecturer at the Mortimer and Raymond Sackler Institute of Advanced Studies**
(http://www.tau.ac.il/institutes/advanced/past_fellows.html). In this competitively sought visiting professorship, I delivered a series of three lectures at Sheba Medical Center and Tel Aviv University in Israel.
- 2016 "Opponent" examiner for thesis defense at Umeå University, Sweden.**
For the PhD thesis defense of Mr. Vijay Jidigam, thesis title, "BMP - a key signaling molecule in specification and morphogenesis of sensory structures", I served as the outside expert.

Completed Funding

- American Cancer Society Institutional Grant.** "An in vitro assay for macrophage-dependent tissue remodeling"
- Elsa U. Pardee Foundation.** "The role of the macrophage in anti-tumor immunity: An in vivo system"
- Searle Scholars Program.** "The role of the macrophage in anti-tumor immunity: An in vivo system"
- R01 EY012370:** "Molecular basis of vertebrate lens induction"
Co-PI with Ali Hemmati-Brivanlou of Rockefeller University. Held for 5 years (12/1/1998 to 11/30/2003)
- R01 EY010559:** "Developing vision: Growth factors in tissue remodeling"
Held for 10 years (1/26/1996 to 12/31/2004)
- R01 EY011234:** "Developing vision: Growth factors in lens morphogenesis."
Held for 9 years (9/1/1996 to 12/31/2004)

7. **R01 EY014105:** “Molecular regulation of lacrimal gland branching”
Held for 5 years (9/1/2001 to 8/31/2006)
8. **R03 EY014826:** “A cell-based therapy for cataracts”
Held for 3 years (8/1/2003 to 7/31/2006)
9. **R01 EY014102:** “Molecular Regulation of Lacrimal Gland Branching”
Held for 5 years (9/1/01 to 8/31/06)
10. **Pearle Vision Foundation Award:** “Programmed Vessel Regression”
Single year award (10/1/2006 to 9/30/2007)
11. **Research to Prevent Blindness:** Lew R. Wasserman Merit Award
Single year award (7/1/2007 to 6/30/2008)
12. **R01 EY015766:** “Wnts in programmed vessel regression”
Held for 5 years (9/23/2004 to 8/31/2009)
13. **R01 EY012609:** “Targeting Survival Factors for Ocular Neovascularization”
Subcontract with Dr. Peter Campochiaro of the Johns Hopkins University
Held for 2 years (4/1/2008 to 3/31/2010)
14. **R01 EY016241:** “Cadherin Functions in Lens Morphogenesis”
Held for 5 years (9/1/2005 to 8/31/2010)
15. **R01 EY019377:** “CRIM1- β -catenin-Cadherin interactions in Eye Development and Disease”
MPI with Dr. Rashmi Hegde of Cincinnati Children’s Hospital Medical Center
Held for 2 years (6/1/2009 to 5/31/2011)
16. **R01 EY017848:** “RhoGTPases in Early Eye Development”
Funding Period 5 years (4/6/2007 to 3/31/2012)
17. **R01 CA131270:** “Macrophage and Tumor Angiogenesis”
Co-PI with Dr. Jeffery Pollard of Albert Einstein College of Medicine
Funding Period 5 year subcontract (12/1/2007 to 11/30/2012)
18. **Binational Science Foundation:** “Sox2 and Pax6 in Eye development”
Co-PI with Dr. Ruth Ashery-Padan of Tel Aviv University (2/1/2009 to 1/31/2013)
19. **R21 EY019125:** “Eyes absent phosphatase inhibitors in eye disease”
MPI with Dr. Rashmi Hegde of Cincinnati Children’s Hospital Medical Center
Funding Period 3 years (8/1/2009 to 7/31/2012)
20. **2R01 EY014648-06A1:** “Molecular Mechanisms of Retinal Determination Proteins”
Funding Period 5 years (4/1/10 – 3/31/13). Hegde PI.
21. **R01 EY016241-06:** “Wnt Pathway Regulation of Lens Polarity”
Funding Period 5 years (3/1/2011 – 2/28/2015). Lang PI.

22. **DOD W81XWH-12-1-0133.** Identification of Molecular and Cellular Contributors to Neurofibroma Formation and Growth. Funding Period 3 years (7/1/2012 – 6/30/2015). Ratner PI.
23. **R01 EY021636-01:** “Retinal Microglia and Angiogenesis”
Funding Period 5 years (5/1/2012 – 4/30/2017). Lang PI.
24. **R01 EY021636-01:** “Light dependent eye development”
Funding Period 5 years (1/1/2013–12/31/2016). Lang/Copenhagen coPI. No cost extension to 12/31/2017
25. **Seed grant,** “Role of mechanistic target of rapamycin (mTOR) in ocular vascular development” from the University of Michigan. CoPI with Steven Abcouwer.
26. **R01 EY027077-01:** “Regulation of vascular development in the eye by an Opsin 5-dependent clock”.
07/01/16 – 06/30/21. Lang/Rao CoPI.
27. **R01 EY027711-01:** “Regulation of eye development by an Opsin5-dopamine pathway”. 07/01/16 – 06/30/20.
Lang/luvone CoPI.
28. **CCHMC Research Innovation and Pilot Funding.** Cortical development via a blue light-Opin 3 pathway.
12/2019-11/2020

Current Funding

29. **Emma and Irving Goldman Scholar Endowed Chair:** 10/2001-present.
30. **R01 EY032029:** “Light regulated vascular development in the eye via the Hippo pathway”. 01/01/2021 – 12/31/2025. Lang/Xin CoPI.
31. **R01 EY032752:** “Mechanisms of intrinsic light responses in the ocular lens”. 02/01/2021 – 01/31/2025. Lang PI. The application received a 1st percentile.
32. **R01EY032566:** Dopamine mediated control of retinal vascular integrity. Samuel/Lang MPI. Proposed June 2022-May 2027. The application received a 1st percentile.
33. **CCHMC Research Innovation and Pilot Funding.** A pilot clinical trial for violet light suppression of myopia. Richard Lang and Veeral Shah Co-PIs.
34. **BIOS Lighting Sponsored Research Agreement.** 11/01/20-10/31/22.
35. **CCHMC Academic and Research Committee Funding** (\$2M) to establish the Science of Light Center.
36. **McClung Foundation.** “The influence of the luminous environment on the development of myopia”. Lang PI with Coinvestigators Lisa Hescong, MA, FIES and Anne Coleman, MD PhD (UCLA). 01/01/2023-12/31/2023.
37. **R01 EY034456:** Melanopsin-dependent, light evoked development of rod photoreceptors. 10/01/2023-09/30/2027.
38. **R01 GM152641:** The mechanism of extra-visual circadian photoentrainment in mammals. Ethan Buhr PI. 09/01/2023-08/31/2027.

Fellowships to lab members

Predoctoral Awards

1. **NIH Minority Supplement awarded to Patricia Dimanlig.** “The Mechanism of lens induction and development” \$35,000/yr for 2.5-year period.
2. **T32-GM063483 Training Grant awarded to MD/PhD student James Stefater III**

Postdoctoral Awards

1. **KO8 awarded to Irene Nunes.** “The function of GRIFIN in lens development”
2. **Japanese Government Fellowship Awarded to Masataka Ito** from the Japanese Medical Defense College. “The mechanism of programmed capillary regression”
3. **NIH NRSA Awarded to Curtis Altmann.** “Vertebrate lens induction”
4. **T32-NIH HD017463 Training grant awarded to Research Fellow April Carpenter-Elrod**
5. **T32-NIH HD046387 Training Grant awarded to Research Fellow Timothy Plageman**
6. **Arnold W. Strauss Fellowship awarded to Research Fellow Yoshinobu Odaka**

Manuscript Review

Cell	Scientific Reports
Current Biology	Nature Communications
Development	Nature
Developmental Biology	Nature Medicine
Faculty of 1000 (2004-2007)	Proc. Nat. Acad. Sci.
Genes and Development	Science

Editorial

2016 Invited Editor, Proc. Nat. Acad. Sci.

National Committee Assignments

National Institutes of Health Extramural Program Review

1. Visual Sciences A/Anterior Eye Disease study section – ad hoc reviewer since 1998.
2. RO3 Application study section – ad hoc reviewer, 2002-2004.
3. National Eye Institute, Visual Sciences A/Anterior Eye Disease study section, 2008-2011.
4. National Eye Institute, Biology of the Visual System study section, 2011- 2012.
5. Co-Chair, ZRG1 BDCn-R(04) Study Section, 2015
6. Ad-hoc reviewer, Biology of the Visual System study section, 2017

National Institutes of Health Intramural Program Review and Program Planning

1. National Eye Institute Lens and Cataract Program Review panel, 2001.
2. National Eye Institute Laboratory of Molecular and Developmental Biology and Sections in the Office of the Scientific Director external review panel, 2005.
3. National Eye Institute representative to Forward Focus Workshop: Strategic Planning for the NIH Common Fund, 2012.

4. National Eye Institute Board of Scientific Counselors, Ad Hoc member, 2012.
5. National Eye Institute Board of Scientific Counselors, Permanent member, 2013-2017.
6. National Eye Institute Audacious Goals review panel, 2013.
7. National Cancer Institute Board of Scientific Counselors, Ad-hoc reviewer, 2016.
8. National Eye Institute Board of Scientific Counselors, Co-Chair, 2018-2019.
9. National Eye Institute Board of Scientific Counselors, Chair, 2019-2020.

Invited Seminars

1992

- Memorial Sloan Kettering Cancer Center, New York
- Fred Hutchinson Cancer Research Center, Seattle.
- Columbia University College of Physicians and Surgeons, New York, Dept. of Biochemistry
- New York University Medical Center, Department of Cell Biology
- University Washington, Seattle, Department of Immunology
- Rockefeller University, New York
- DNAX, Palo Alto, California

1993

- Searle Scholars Meeting – Chicago, IL

1994

- UMDNJ, Dept. Biochemistry and Genetics, New Jersey
- Searle Scholars meeting, Chicago
- Alton Jones Cell Science Center Apoptosis Conference, Lake Placid, New York

1995

- Rockefeller University, New York
- Searle Scholars meeting, Chicago
- Gordon Research Conference on Cell Death

1996

- SUNY Brooklyn
- New York area Cell Death Society, Rockefeller University
- Picower Institute at North Shore University Hospital

1997

- Gordon Research Conference on Cell Death
- Cold Spring Harbour Conference on Programmed Cell Death
- Fred Hutchinson Cancer Research Center, Seattle
- University of Washington, Seattle, Dept Immunology

1998

- UMDNJ, Dept. Biochemistry and Genetics, New Jersey

1999

- Belgian Society for Cell Biology, Gent
- Phagocytes Gordon Conference
- Genentech, Inc.
- Glaucoma Foundation “Think Tank”
- Baylor College of Medicine
- Albert Einstein College of Medicine

2000

- EMBO conference on the homeodomain, Ascona, Italy
- Rheumatology Department, NYU

- Woods Hole course lecturer: “Fundamental Issues in Vision Research: Molecular and Cell Biological Approaches” lecture on Pax6
- ICER (International Congress of Eye Research) conference, Santa Fe
- Banbury Center meeting on Cell Death and Phagocytic Recognition
- Developmental Biology Division, Cincinnati Children’s Hospital

2001

- New York University Biology Department
- Conference on Eye Development and Evolution, Fondation des Treilles, Provence, France

2002

- University of Texas, MD Anderson
- University of Cincinnati, 7th Annual Ophthalmology Research Symposium
- University of Pennsylvania
- Visual Systems Gordon Conference
- Woods Hole course lecturer: “Fundamental Issues in Vision Research: Molecular and Cell Biological Approaches” lecture on Pax6
- University of Alabama at Birmingham, Department of Cell Biology
- University of Dayton
- University of Columbus

2003

- Pasteur Institute
- University of Edinburgh
- Great Lakes Vision Research Conference, Chair, Lens Regeneration session

2004

- North American Vascular Biology Organization
- Keystone Meeting on Cell Death in Development
- Genentech, Inc.
- Association for Research in Vision and Ophthalmology. Mini-symposium on signaling pathways in lens development.
- Genetic control of eye development and evolutionary implications, Madrid
- Max Planck Institute for Molecular Genetics, Berlin
- Chair and speaker, Determination session, Gordon Research Conference on Visual Systems Development
- Riken Institute Vascular Biology Symposium, Japan
- University of Tokyo, Institute of Medical Science.
- International Congress for Eye Research, Sydney, Australia
- Walter and Eliza Hall Institute, Melbourne, Australia

2005

- University of Cincinnati, 8th Annual Ophthalmology Research Symposium
- Miami University, Research Seminar Series
- First Annual Conference of the ARVO/Pfizer Ophthalmics Research Institute on Angiogenesis, Neovascularization and Vasoproliferation.
- Organizer, Abrahamson Pediatric Eye Institute and Great Lakes Vision Research Conference, Cincinnati.

2006

- Cornell University, Department of Cell and Developmental Biology, New York City
- J. Michael Bishop Symposium: “An Unexpected Life in Science,” University of California, San Francisco
- University of Texas, Austin, Department of Molecular, Cell and Developmental Biology
- Hospital de la Salpêtrière, INSERM, Paris, France.
- Woods Hole course lecturer: “Fundamental Issues in Vision Research: Molecular and Cell Biological

Approaches” lecture on Pax6

- St. Jude Children’s Hospital Research Foundation, Memphis.
- International Congress for Eye Research, session moderator – Buenos Aires, Argentina

2007

- University of Michigan Kellogg Eye Center
- Pennsylvania State University
- Keystone Meeting on Macrophage Biology
- ARVO Conference on Ocular Oncology
- Gordon Conference on Phagocytes – Bryant University, Smithfield, RI
- Midwest Orthoptics Meeting
- Session Chair, National Foundation for Eye Research US-Japan Cooperative Cataract Research Group – Kona, Hawaii

2008

- US-Japan Cancer Research Workshop “Regulation of Tumor Angiogenesis and Lymphangiogenesis” – Kyoto, Japan
- Washington University – St. Louis, MO
- The Pasteur Institute - Metchnikoff’s Legacy in 2008 – Paris, France
- Genentech – San Francisco, CA
- Gordon Research Conference on Visual Systems Development – Newport, RI
- Woods Hole course lecturer: “Fundamental Issues in Vision Research: Molecular and Cell Biological Approaches” – lecture on lens induction and Pax6
- University of Louisville – Louisville, KY

2009

- University of Utah – Salt Lake City, UT
- University of Wisconsin – Madison, WI
- Society for Developmental Biology – San Francisco, CA
- University of Pittsburgh, Scholars in Vision Science seminar series. Pittsburgh, PA.
- 4th World Congress on Regenerative Medicine – Leipzig, Germany
- Van Andel Research Institute – Grand Rapids, MI

2010

- National Eye Institute - 2 lectures entitled: “Lens induction and morphogenesis” and “Macrophage Wnts in programmed vascular regression and tissue regeneration”
- University of Denver – Denver, CO
- International Congress for Eye Research, session speaker – Montreal, Canada
- Medical College of Wisconsin – Milwaukee, WI
- University of Kentucky – Lexington, KY

2011

- New York University – New York, NY
- University of Illinois at Chicago – Chicago, IL
- European Molecular Biology Organization “Frontiers in Sensory Development” – Barcelona, Spain
- CCHMC-Israel Collaboration Conference at Tel Aviv University, Weizmann Institute – Tel Aviv, Israel
- National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) – “Mechanisms of Organ Repair & Regeneration” – Ellicott City, MD. Meeting organizer.

2012

- Johns Hopkins University, The Wilmer Ophthalmological Institute, Baltimore, MD
- Keystone Symposium: Angiogenesis: Advances in Basic Science and Therapeutic Applications, Snowbird, UT
- CCHMC-Israel Collaboration Conference, Israel
- International Congress for Eye Research, Berlin, Germany

- Gordon Research Conference on Visual Systems Development – Colby Sawyer College, NH
- International Kloster Seeon Meeting “Angiogenesis - Molecular Mechanisms and Functional Interactions”, Germany
- Second Biennial Symposium on Age-Related Macular Degeneration, Harvard medical School, Boston
- Symposium: New Concepts for Tissue-Specific Regenerative Medicine, University of Cincinnati

2013

- University of California, San Francisco, The Kimura Lecture
- David Copenhagen, Festschrift Symposium, University of California – San Francisco
- Indiana University, Biology Department, Bloomington, IN
- Baylor College of Medicine, University of Texas, Houston, TX
- FASEB Experimental Biology Conference, Boston, MA
- SUNY Downstate, Brooklyn, NY
- Gordon Research Conference on Apoptotic Cell Recognition & Clearance at the University of New England in Biddeford, ME
- Gordon Research Conference on Neural Crest & Cranial Placodes, Stonehill College, Easton, MA
- Gordon Research Conference on Angiogenesis, Newport, Rhode Island
- Visiting Professor Lecture Series, Department of Ophthalmology, Harvard University. Two lectures entitled, “Vascular development and Metchnikoff’s policemen” and “A fetal light response pathway guides ocular development”
- Case Western Reserve University, Pharmacology Department, Cleveland, OH
- Visiting Professorship, Ophthalmology Department, Columbia University, New York, NY

2014

- Cleveland Clinic, Cole Eye Center, Cleveland, OH
- Sackler Lecturer at the Mortimer and Raymond Sackler Institute of Advanced Studies, Israel. Three lectures, at Sheba Medical Center and Tel Aviv University, entitled:
 1. “Macrophage Wnts in development, regeneration and tumorigenesis”
 2. “Mechanisms of development and morphogenesis using the eye as a model” and
 3. “Myeloid cells and light responses in the regulation of neural and vascular development”
- Gordon Research Conference Endothelial Cell Phenotypes in Health and in Disease, Girona, Spain
- Angiogenesis Conference, Nara Institute of Science and Technology, Japan
- ZING Research Conference on *Genes, Epigenetics and Evolution in Eye Development and Disease* Toledo, Spain
- Third International Biennial Symposium on AMD, Harvard Medical School Department of Ophthalmology, Boston, MA
- Symposium on Macrophage Function in Health and Disease, University of Edinburgh

2015

- University of Cincinnati, Annual Ophthalmology Research Symposium
- Basic Clinical Lecture, ARVO Annual Meeting, Denver, CO
- The Third Circulation: Lymphatics as Regulators in Health and Diseases, NIH, Bethesda, MD

2016

- University of Cincinnati, Annual Ophthalmology Research Symposium
- Umeå University, Sweden, International Seminar Series
- Society for Research in Biological Rhythms, Tampa, FL
- The Walter and Eliza Hall Institute, Melbourne, Australia
- 19th International Vascular Biology Meeting, Boston, MA
- The Bergy Lecture, University of Washington, Seattle, WA

2017

- Gordon Conference on Vascular Cell Biology, Ventura, CA
- Kellogg Eye Center at the University of Michigan

- The Queen's Medical Research Institute, University of Edinburgh, UK
- The Biology and Chemistry of Vision FASEB meeting, Steamboat Springs, CO
- Lighthouse Guild Symposium to celebrate the Bressler Prize for Russell Van Gelder
- Emory University, Emory Eye Center, Atlanta, GA

2018

- Society for Research in Biological Rhythms, Jacksonville, Florida
- Gordon Research Conference on Visual Systems Development – Italy
- University of Illinois at Chicago
- University of Manchester, School of Medical Sciences
- University of Michigan. Two lectures entitled:
 "Opsin 4 and Opsin 5 response pathways in eye vascular development and disease" and
 "Extraocular photoreception in mammalian regeneration, metabolism and homeostasis"
- Baylor College of Medicine, Department of Molecular Physiology and Biophysics, Houston, TX
- Department of Human Molecular genetics and Biochemistry, Tel Aviv University, Israel
- 66th Katzir Conference on Circadian Rhythms, Weizmann Institute, Israel

2019

- David C. Beebe Lecture, Washington University St Louis, Department of Ophthalmology and Visual Sciences
- Johns Hopkins, Neuroscience Department
- Association for Research in Vision and Ophthalmology, Annual Meeting, Special Interest Group, on Atypical Opsins. Organizer, with Melanie Samuel of Baylor College of Medicine.
- University of Cincinnati, Annual Ophthalmology Research Symposium
- Keynote Lecture, Advances in Pediatric Retina Conference, Utah.
- University of Victoria, British Columbia, Canada

2020

- National Eye Institute Scientific Director Seminar Series, "Atypical opsins, inside and outside the eye."
- University of Louisville, Department of Ophthalmology and Visual Sciences
- University of Cincinnati, Department of Ophthalmology Grand Rounds
- University of California, Irvine, Ophthalmology Department Distinguished Speaker Series (via Zoom)

2021

- Endocrine Research Forum, Division of Endocrinology, CCHMC
- UC San Diego Center for Circadian Biology "Atypical opsins in development and homeostasis"
- Association for Research in Vision and Ophthalmology, 2021
- Princeton Propellers Alumni Association, "Second Tuesdays".
- Lightfair, invited speaker co-presenting with Robert Soler of BIOS Lighting, Inc.
- University of Alabama, Birmingham, Department of Ophthalmology and Visual Sciences.

2022

- National Glass Association. "Physiological impacts of light on human health and the implications for glazing". Co-presentation with Lisa Hescong and Thomas Culp.
- The Heterogeneity and Plasticity of Adipose Tissue, CPH BAT conference, Denmark, "Atypical opsin light sensing pathways and regulation of metabolism."
- Hayball, Melbourne Australia. "Physiological impacts of light on human health and the implications for building design."
- Lighting Physiology Interest Group. "Mammalian light sensing pathways and building design."
- Pacific Northwest National Labs, "The implications of atypical opsin biology for building design".
- Symposium on Biology of the non-visual opsins. University of Washington, Seattle.
- Diabetes & Metabolism Research Center, Ohio State University
- Texas Society for Circadian Biology and Medicine. Keynote Speaker.

- International Society for Eye Research, Gold Coast, Australia. "Atypical opsins inside and outside the eye."
- St Vincent's Institute. "New light sensing pathways in the regulation of development, metabolism and disease"
- Murdoch Children's Research Institute. "New light sensing pathways in the regulation of development, homeostasis and disease"
- Department of Anatomy and Physiology, University of Melbourne. "Opsin 3 and Opsin 5 extraocular light sensing pathways in the regulation of metabolism."
- Center for Eye Research Australia. "Opsins 3, 4 and 5 in eye development and disease."
- Bone Marrow Transplant Unit, CCHMC
- Panel Discussion, C3 Circadian Conference, CCHMC/UC
- Neuroscience Graduate Program, University of Cincinnati
- National Institutes of Health, 2nd Annual NIH Investigator Meeting for Interoception Research

Publications

1. Gonda T, Metcalf D, **Lang RA**, Gough N, & Dunn A (1985) Experimental induction of autocrine synthesis of GM-CSF results in leukemogenicity. *Cancer Cells* 4:435-441.
2. **Lang RA**, Metcalf D, Gough NM, Dunn AR, & Gonda TJ (1985) Expression of a hemopoietic growth factor cDNA in a factor-dependent cell line results in autonomous growth and tumorigenicity. *Cell* 43(2 Pt 1):531-542.
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Web Sites for Lang:

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