

Wearable Dosimeters and Light Loggers: Performance, Miniaturization and Health Metrics

04 – 06 February 2024
Optica Headquarters
Washington, DC, USA



Table of Contents

Welcome	3
Sponsors	4
Agenda	5
Hosts	7
Attendees	10
Map	20
Code of Conduct	21

Welcome

Hello and welcome to Washington, DC, and the **Optica Incubator on Wearable Dosimeters and Light Loggers: Performance, Miniaturization and Health Metrics**. This program has been developed by Manuel Spitschan, Technical University of Munich; Rigmor Baraas, University of South-Eastern Norway; and Francisco Imai, Past Chair, Optica Color Technical Group.

The incubator begins on the evening of 04 February with a welcome dinner at 18:00 at La Tomate, located at 1701 Connecticut Ave NW. The following morning, Monday, 05 February, there will be breakfast at 8:30, with the program beginning at 9:00 at Optica Headquarters. We have enclosed a map for your reference.

Incubator Meetings are designed to provide a unique and focused experience, allowing colleagues working in a niche field to meet and engage in discussions of related advances, challenges and opportunities. If you have feedback on the format of the [Incubator program](#) or suggestions for future Incubators, please share your thoughts with Hannah Walter-Pilon, Optica Director of Technical Community Engagement at incubators@optica.org.

Sincerely,



Elizabeth A. Rogan

Get Connected

Wireless: 2010MassGuest

Password: LightSpeed!

Share Your Experience

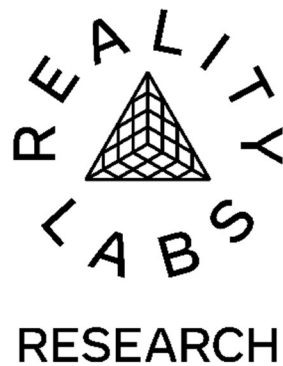
Share your photos and post about your incubator experience across social media! Make sure to use the hashtag [#OpticalIncubator](#).

Join Optica

As an incubator attendee, you can receive 50% off your first year of Optica membership. Visit optica.org/join and use the code **IM-JOIN50**.

Our Sponsors

Optica and our hosts would like to thank the following sponsors for their support of this incubator meeting.



Incubator on Wearable Dosimeters and Light Loggers: Performance, Miniaturization and Health Metrics

04 - 06 February 2024

Hosted by:

Manuel Spitschan, Technical University of Munich, Germany
Rigmor Baraas, University of South-Eastern Norway, Norway
Francisco Imai, Past Chair, Optica Color Technical Group, United States

Sunday, 04 February 2024

Afternoon **Attendees arrive in DC and check into the Royal Sonesta Hotel**
The Royal Sonesta, 2121 P St NW

18:00 EST **Welcome Dinner**
La Tomate, 1701 Connecticut Ave NW

Monday, 05 February 2024

08:30 EST **Breakfast at Optica Headquarters**
2010 Massachusetts Ave NW

09:00 EST **Welcome Remarks**
P. Scott Carney, Chief Science and Technology Officer, Optica

09:15 EST **Program Goals**
Manuel Spitschan, Rigmor Baraas and Francisco Imai

09:30 EST **Panel Discussion**

Topic:

How should data from wearable dosimeters and light loggers be analyzed and summarized and related to health outcomes? Is this personalized, health-related data and if so, how should it be treated?

Panelists:

*Johannes Zauner, Technical University of Munich
Aaron Nicholls, Meta Reality Labs*

11:00 EST **Coffee Break**

11:30 EST **Breakout Session 1**

12:30 EST Report Out from Breakout Session

13:00 EST Lunch at Optica Headquarters

14:00 EST Panel Discussion

Topic:

What technical opportunities are there for improving the capability and availability of wearable dosimeters and light loggers?

Panelists:

*Lisa Ostrin, University of Houston College of Optometry
Vineetha Kalavally, Monash University*

15:30 EST Coffee Break

16:00 EST Breakout Session 2

17:00 EST Report Out from Breakout Session

17:30 EST Networking Dinner

CityTap Kitchen & Craft Dupont, 1250 Connecticut Ave NW

Tuesday, 06 February 2024

08:00 EST Breakfast at Optica Headquarters

2010 Massachusetts Ave NW

08:30 EST Panel Discussion

Topic:

How can wearable dosimeters and light loggers be miniaturized for non-invasive and ubiquitous wear?

Panelists:

*Christine Wildsoet, University of California Berkeley
JanKai Chang, Wearifi Inc.
Cameron Miller, U.S. National Institute of Standards and Technology*

10:00 EST Coffee Break

10:30 EST Breakout Session 3

11:30 EST Report Out from Breakout Session

12:00 EST Lunch at Optica Headquarters

13:00 EST Wrap-up and Discuss Next Steps

14:00 EST Adjourn

Hosts



Rigmor Baraas

*Professor, University of South-Eastern Norway
rigmor.baraas@usn.no*

Rigmor C. Baraas has a PhD in visual neuroscience from the University of Manchester, UK and is a professor in optometry and vision science at the University of South-Eastern Norway. She heads the Colour Vision and Retinal Imaging (CVRI) Lab at the National Centre of Optics, Vision, and Eye Care. Her research includes work on understanding colour vision, retinal structure, eye growth and refractive errors such as myopia, along with functional, environmental, and genetic associations.



Francisco Imai

Senior Color Scientist, Apple Inc.

francisco.imai@gmail.com

Francisco Imai is a color imaging researcher whose interests include computational color photography, computer vision, and spectral imaging. He has authored or co-authored 2 book chapters, 15 peer-reviewed journal papers, 44 conference papers, and 46 granted patents on imaging topics ranging from color appearance, spectral imaging and printing, high-dynamic range imaging and computational color

imaging. Dr. Imai received his BE in electrical engineering and MS in computer engineering at Technological Institute of Aeronautics (Brazil) followed by a PhD in imaging science from Chiba University (Japan). He joined RIT and worked on spectral imaging research. He moved to Pixim Inc., a start-up company in the field of High-Dynamic Range Imaging. After that he joined Samsung R&D, working with low-light imaging and Human-Computer Interaction projects. Dr. Imai also worked for Canon for more than 7 years managing a group at Innovation Center focused on research of computational imaging and data analytics technologies. He currently works for Apple Inc. as Senior Color Scientist. He served as Conference Vice President for IS&T from 2014 to 2019. He is also a member of the board of counselors for the Munsell Color Science Laboratory, Rochester Institute of Technology (RIT) since August 2014 as well as Adjunct Senior Scientist of Texas Health Center at Houston School of Dentistry since August 2014. Dr. Imai is recipient of IS&T fellowship in 2013 for outstanding achievement in imaging science and engineering for significant contributions to the advancement of color reproduction and multispectral imaging. He became Optica Senior member in 2020. Dr. Imai was Optica Color Technical Group Chair from 2021 to 2023 and besides organizing webinars he has been involved in hosting Optica incubator meetings, the last one on Perception in Immersive Technologies in August 2021. Dr. Imai was leading guest editor for Applied Optics special issue on imaging systems in 2013 and 2014. He has also member of the imaging rapid action committee for OSA in 2014. Dr. Imai has been active in the Optical Society (Optica) and the Society for Imaging Science and Technology (IS&T) conferences such as Optica IS in 2012, 2013 and 2021, IS&T CIC, EI MAAP, EI ISS, VISAPP, IMPROVE and served as reviewer for numerous journals and conference such as Applied Optics, JOAA A, Optics Express, Journal of Imaging Science and Technology, Journal of Electronic Imaging, IEEE Transactions on Image Processing, CVPR, ICCV, AIC, CGIV, CCIW among others meetings.



Manuel Spitschan

Assistant Professor, Technical University of Munich & Max Planck Institute for Biological Cybernetics

manuel.spitschan@tum.de

Prof. Dr. Manuel Spitschan's research focuses on the effects of light on human physiology and behaviour, in particular with respect to the biological clock, circadian rhythms and sleep. In his research, he combines chronobiological assessments with cutting-edge methods for measuring, characterising and generating light stimuli, both in laboratory and field. Prof. Dr. Spitschan studied psychology at the University of St Andrews and received his PhD from the University of Pennsylvania. From 2016 to 2017 he was post-doc at Stanford University and from 2017 until 2021, he was a Sir Henry Wellcome Fellow and was promoted to University Research Lecturer (2020–2021). In January 2022, Prof. Dr. Spitschan was appointed to the Rudolf Mößbauer Tenure Track Assistant Professorship "Chronobiology & Health" at TUM and as Max Planck Research Group Leader at the Max Planck Institute for Biological Cybernetics. In 2023, he received the David Marr Medal from The Applied Vision Association, and became a PI at TUMCREATE (Singapore).

Attendees



Geoffrey Aguirre

Professor, University of Pennsylvania
aguirreg@mail.med.upenn.edu

Geoffrey Aguirre is a Professor of Neurology at the University of Pennsylvania. His area of clinical specialty is Behavioral Neurology, which encompasses disorders of higher-level cognitive function. Aguirre's scientific work is in the area of translational vision science. He relates human visual perception to quantitative measurements of the structure and function of the visual pathway. Magnetic resonance imaging (MRI) is an important technique in his studies, often coupled with retinal imaging and psychophysics. A particular focus is how neurologic and ophthalmologic disease alters function along the visual pathway. In a developing research program, he is relating measures of light exposure to perceptual and neural responses in people with migraines.



JanKai Chang

CTO, Wearifi Inc
jkchang@mywearifi.com

Dr. Jan-Kai Chang is the co-founder and Chief Technology Officer of Wearifi Inc and holds the position of senior research collaborator at the Querrey Simpson Institute for Bioelectronics, Northwestern University. With 8 years of expertise in bioelectronics technology, Dr. Chang has cultivated collaborations with top experts and professionals across industry and academia. His contributions have led to the publication of 13 papers with Wearifi, positioning the company at the forefront of wearable skincare innovations visible/IR and X-ray domains. He currently serves as the congress chair of Optica's Imaging congress and a general co-chair of SPIE's

Anomaly Detection and Imaging with X-ray conference. His current research focuses on quantum-inspired imaging and X-ray transmission/diffraction imaging and sensing.



Bill Choi

CEO, Nanolambda
ok2bill@nanolambda.net

Bill Choi, founded nanoLambda in Korea in 2010. Since then nanoLambda has been developing the world smallest optical spectrometer products and also introduced a Wearable Dosimeter and Light Logger, XL-500, which is well received by research community in Europe, US and Asia. In 2021 nanoLambda received SPIE Prism Awards in Smart Sensing category, and in 2023 nanoLambda received LpS Digital Awards in sensor product category. Prior to nanoLambda, Bill worked for Samsung Electronics and startups in Korea and US. Bill believes this event would be a good opportunity to learn the needs directly from users and experts, for further improvement and the future development.



Ali Heshmati

Senior Architect/Ph.D. Candidate, Norwegian University of Science and Technology
ali.heshmati@ntnu.no

Heshmati is a distinguished practitioner-scholar who has dedicated over three decades to the fields of architecture, academic research, teaching, and public art. His career has been a remarkable journey, marked by a deep commitment to bridging the gap between the cutting-edge of scientific knowledge and architectural practice. He focuses on the impact of the built environment on human health, performance, happiness, and wellbeing, to integrate findings into contemporary academic and professional architectural practices. Through his research Heshmati explores the consequential impact of the built environment on human health. This groundbreaking work, which he has coined as

"Biometric Architecture," seeks to uncover the physiological markers of the influence of architectural spaces on human physical and emotional well-being. This multidisciplinary research, between architecture and neuroscience, seeks to gather quantitative neurobiological evidence or biomarkers for the impact of built environment on people. He is on a mission to discover measurable biomarkers which signify the embodied experience of architectural design and its tangible impact on human mental and physiological health. These biomarkers will be the main design parameters for the future human environment. While Ali Heshmati's early career, spanning two decades, was dedicated to shaping and enhancing the quality of the built environment for human habitation, the past ten years have witnessed a transformative shift towards examining how the built environment in turn shapes its inhabitants. His singular focus has transitioned from creating spaces for people to live, work, and thrive to gathering concrete physiological evidence which can improve the human experience and promote mental and physiological health and wellbeing. This is a journey that has positioned Heshmati at the forefront of emerging field of evidence-based human-centric architecture. Ali's career has been marked by his involvement in numerous award-winning projects across the USA, Norway, and Central Europe. With more than 30 awards of excellence, his expertise spans a wide range of project types, from kindergartens, libraries, and cultural venues to pedestrian bridges, temporary public art installations, private residences, and urban design projects. As a thought leader, most recently, Heshmati has initiated a global knowledge sharing schedule including talks, presentations, and popular science articles for professional with diverse backgrounds. He has held talks on his research on the "impact of available light in interior environments on the brain's regulation of the circadian rhythms as a major indicator of human health and wellbeing.



Kevin Houser

*Professor, Oregon State University
kevin.houser@oregonstate.edu*

Kevin Houser (PhD, PE, FIES, LC, LEED AP) is a Professor at Oregon State University with a joint appointment as Chief Engineer at Pacific Northwest National Laboratory, co-founder of Lyr Lux, Inc., and former editor-in-chief of LEUKOS, the journal of the Illuminating Engineering Society (IES). He has published more than 125 publications about light and lighting and has delivered more than 125 presentations on 6 continents. He's won the CIBSE Leon Gaster and Walsh Weston Awards, IES Taylor Technical Talent Award three times, Edison Report Lifetime Achievement Award, the IES Presidential Award, and is a Fellow of IES. His work focuses on human perceptual and biological responses to light, endeavoring to balance human needs with planetary health.



Vineetha Kalavally

*Associate Professor, Monash University
vineetha@monash.edu*

Dr. Vineetha Kalavally is currently an Associate Professor and Deputy Head at the Department of Electrical and Robotics Engineering at the School of Engineering, Monash University Malaysia. She is also the director of the Intelligent Lighting Lab and leads a research group focused on Solid State Lighting. Her team has developed a novel, highly accurate wearable light dosimeter which captures the spectral power density data close to eye level in the visible wavelength range 380-780 nm and provides several metrics relating light exposure and the human circadian rhythm. Vineetha is recognised internationally as an expert in the field of human centric lighting, particularly in the field of light metrology using wearable dosimeters and spectral engineering for non-visual benefits. As the director of a world class Lighting Laboratory within Monash University, she has successfully led many collaborative research projects with international

partners such as OSRAM, Harvard University, University of Chula Longkorn and University of Basel in Switzerland.



Cameron Miller

Sensor Science Division, Deputy Chief, U.S. National Institute of Standards and Technology
c.miller@nist.gov

Cameron Miller joined the National Institute of Standards and Technology in 1996 and from 2013 to 2021 was the group leader for the Optical Radiation Group. In 2022 Cameron became the Deputy Division Chief for the Sensor Science Division. Currently, he is focusing on research include all aspects of Photometry & Radiometry, Germicidal Ultraviolet Irradiance, Photopolymer additive manufacturing, and measurement uncertainty. Cameron is active in standards organization and professional societies, such as IES - Testing Procedure Committee & the Science Advisory Panel, International Ultraviolet Association (IUVA), CIE, ASTM, and PAMA. He is also an NVLAP assessor for the Energy Efficient Lighting Program and the Calibration Program. Cameron Miller obtained his PhD in Physical Chemistry from Cornell University (1994).



Aaron Nicholls

Research Scientist, Meta Reality Labs
aaronn@fb.com

Aaron Nicholls is a research scientist at Reality Labs Research (formerly Oculus Research), where he founded the Perceptual Science team a decade ago. Coming from a computer science background, his work focuses on how perceptual research can inform future technologies, with a special interest in emmetropization and myopia.



Lisa Ostrin

Associate Professor, University of Houston College of Optometry

lostrin@central.uh.edu

Lisa Ostrin is an Associate Professor at the University of Houston College of Optometry. She received a BA in Studio Art at the University of Texas at Austin and then completed an OD/PhD at the University of Houston College of Optometry. She went to John Hopkins University for post-doctoral research in low vision and retinal prosthetics. She then worked as a Clinician Researcher at the University of California Berkeley, with a focus on myopia. She returned to the University of Houston to continue her work in myopia, conducting studies in both human participants and animal models. She is interested in environmental factors and visual cues that contribute to myopia onset and progression, as well as in the development and testing of novel myopia treatments. In addition to research, Dr. Ostrin teaches gross and ocular anatomy and has authored a book, *Anatomy of the Human Eye: a Coloring Atlas*. Dr. Ostrin is a fellow of the American Academy of Optometry, Gold Fellow of ARVO, and a recipient of the American Optometric Foundation Ezell Fellowship and the University of Houston College of Optometry Cora and J Davis Armistead Teaching Award.



Erik Page

CEO, Blue Iris Labs

erik@blueirislabs.com

Erik Page has been conducting research in lighting related fields for over 30 years including work involving light sources, light sensors, luminaires, lighting control systems and human factors. Lighting sensors, lighting control systems, and the impacts of light on human health have been a particular focus for the last decade where he became a recognized expert. His lighting controls and sensor work has included both the technology side (where Page has several patents) as well as the market and policy side (where he has several research publications). Over

Page's career, his focus has always been on "applied research" where emphasis has been placed on developing promising lighting technologies and transferring them from the laboratory to the marketplace. While working for the University of California (first for 10 years as a researcher in the Lighting Research Group at Lawrence Berkeley National Laboratory and later for 5 years as a founder and Director of Engineering of the California Lighting Technology Center at UC Davis), Page has worked closely with many companies to develop and commercialize products that were based on concepts, research and/or analysis that we generated in the laboratory. Now, as a founder and CEO of Blue Iris Labs, he is focused on developing systems that allow people and organizations to quantify the light exposure that people experience in real-world applications. It is his deeply held belief there are significant scientific, social, and commercial benefits to quantifying the light exposure patterns that modern humans experience so that we can better understanding the ways this critical environment input impacts human health.



Morgan Pattison

Lighting Scientist, SSLS, Inc
morgan@sslsinc.com

Dr. Morgan Pattison is a LED Lighting Scientist and is Senior Consultant to the U.S. Department of Energy Lighting R&D Program. As an advisor to the DOE Lighting Program, Dr. Pattison identifies priority R&D for the advancement of lighting that saves energy while supporting building occupant health. Dr. Pattison coordinates the DOE Lighting-Physiology Interest Group which provides inputs to the DOE on the latest understanding of light and health. Dr. Pattison also coordinates DOE efforts in the topics of animal responses to light and horticultural lighting. Dr. Pattison has a PhD in Materials Science from UCSB with thesis research on novel LED structures.



Luis Filipe Rossi

Founder/CTO, Condor Instruments
lr@condorinst.com.br

Luis Filipe Rossi holds a PhD in Engineering and is the founder and CTO of Condor Instruments, a company dedicated to developing wearables and solutions for medical and scientific applications, primarily focused on Circadian Rhythm and Sleep Medicine.



David Sullivan

Hardware Systems Engineer Lead, Meta
dtsullivan@meta.com

Mechanical engineer by training supporting basic research across multiple industries over the last couple decades. Most recently in foundational neuroscience prior to joining Reality Labs Research in 2022 where we're supporting research into myopia development and multi-sensory integration among other avenues of inquiry. Lead on development of our glasses formfactor light logging device (VEET).



Christine Wildsoet

Professor in Optometry & Vision Science, University of California Berkeley
wildsoet@berkeley.edu

Dr Wildsoet is a full professor at the University of California Berkeley. Her primary educational training spans clinical optometry and pharmacology, all completed in Australia (Queensland University of Technology & University of Queensland resp.), where she also completed a PhD in visual neuroscience, with a focus on animal models of myopia (near-sightedness). She is a fellow of both the American Academy of Optometry (AAO) and Association for Research in Vision and Ophthalmology (ARVO), a long-term member of the Investigative Ophthalmology and

Visual Science (IOVS) editorial board, and current board member of the International Myopia Institute (IMI), Scandinavian Journal Optometry and Visual Science and World Health Organization Myopia Initiative Committee. She is also currently serving on the advisory board of the MyoTreat Doctoral network. Dr Wildsoet is considered a world expert on refractive errors, placed in the top 0.1% of scholars writing on this topic in the last 10 years, based on Expertscape's PubMed-based algorithms. On-going research is multidisciplinary in nature, with on-going investigations into the visual environmental influences on eye growth regulation and myopia, the cellular and molecular signaling pathways involved, novel treatments (including optical and pharmacological) for myopia control, and mechanisms underlying the increased risk of myopes to secondary ocular pathologies, including glaucoma. This research makes use of both in vitro and in vivo approaches and both human- and animal models, with clinician scientists, as well as both graduate and undergraduate students involved along with collaborators, both local and international. She was recently awarded an honorary doctorate from her alma mater, Queensland University of Technology (QUT), Brisbane, Australia, for her contribution to science and the education and mentorship of students.



Johannes Zauner

*Postdoctoral Researcher, Technical University Munich
johannes.zauner@tum.de*

Johannes Zauner works as a researcher in the field of "Chronobiology and Health" in circadian datascience at the Technical University of Munich, having completed his PhD in Human Biology. After his apprenticeship in architectural drafting, he studied Interior Design and Architecture, and worked as a freelance planner as well as in research on energy-efficient buildings, daylighting and artificial lighting. Inspired by a pilot project in the field of "Light and Health" with the German Federal Environmental Foundation (DBU), he shifted his research focus to study the effects of light on humans. As a freelance

partner of the Munich lighting design and engineering firm 3lpi he incorporates his studies into planning practice. Johannes Zauner is a member and spokesperson for the technical-scientific committee (TWA) of the German Lighting Technology Society (LiTG) for melanopic light effects, a member of the Expert Forum for Interior Lighting (EFI), and the CIE JTC20 for wearable alpha-opic dosimetry and light logging methods.

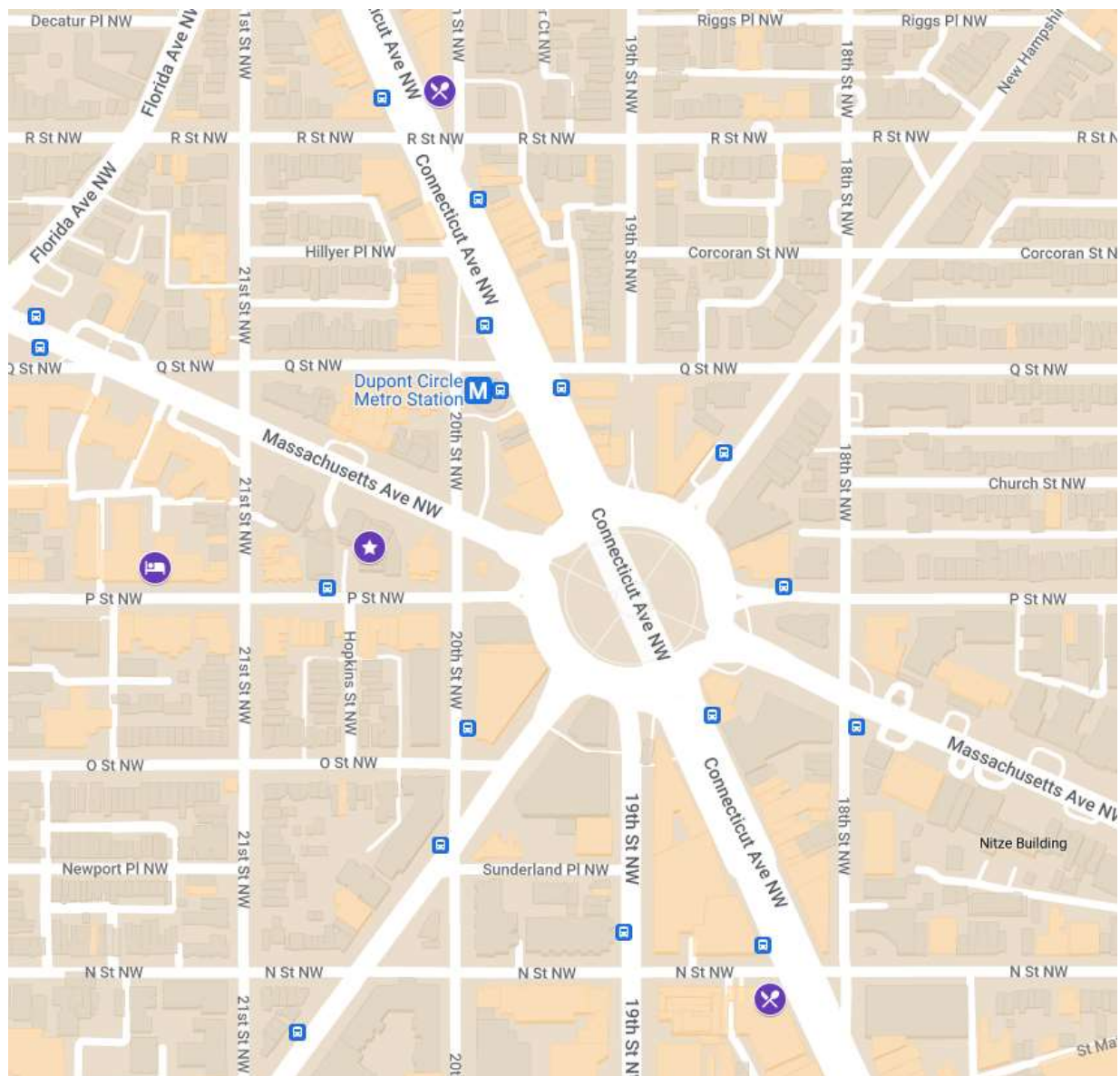
Map

Optica Headquarters: 2010 Massachusetts Ave NW

Royal Sonesta Hotel: 2121 P St NW

Welcome Dinner: La Tomate, 1701 Connecticut Ave NW

Networking Dinner: CityTap Kitchen & Craft Dupont, 1250 Connecticut Ave NW



Wearable Dosimeters and Light Loggers: Performance, Miniaturization and Health Metrics

Anti-Harassment Policy and Code of Conduct

Optica is committed to providing an environment that is conducive to the free and robust exchange of scientific ideas. This environment requires that all participants be treated with equal consideration and respect. While Optica encourages vigorous debate of ideas, personal attacks create an environment in which people feel threatened or intimidated. This is not productive and does not advance the cause of science. All participants in Optica and Optica-managed events and activities are therefore expected to conduct themselves professionally and respectfully.

It is the policy of Optica that all forms of bullying, discrimination and harassment, sexual or otherwise, are prohibited in any Optica or Optica-managed events or activities. This policy applies to every individual at the event, whether attendee, speaker, exhibitor, award recipient, staff, contractor or other. It is also a violation of this policy to retaliate against an individual for reporting bullying, discrimination or harassment or to intentionally file a false report of bullying, discrimination or harassment.

Bullying, discrimination and harassment of any sort by someone in a position of power, prestige or authority is particularly harmful since those of lower status or rank may be hesitant to express their objections or discomfort out of fear of retaliation.

Optica may take any disciplinary action it deems appropriate if, after thorough investigation, it finds a violation occurred.

For complete policy information visit optica.org/codeofconduct.

If you wish to report bullying, discrimination, or harassment you have witnessed or experienced, you may do so through the following methods:

- Use the online portal optica.org/incidentreport
- Email codeofconduct@optica.org