

A VISION FOR THE FUTURE

LIGHT+SENIORS

MARCH 6 & 7, 2012 | WASHINGTON, D.C.



2012 IES Research Symposium



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November 2012

Dear Colleague:

On behalf of the Illuminating Engineering Society of North America (IES) and our participating partners we are excited to share with you the final report and proceedings from the first IES Research Symposium: Light + Seniors – A Vision for the Future.

The symposium was designed to investigate and report on new ways that lighting can be used to maintain vision, mental and physical health, and quality of life for those with aging eyes and especially for those who wish to remain in their own homes as they grow older.

The purpose of the symposium was to generate interest in lighting for seniors by bringing together leaders in the field to accomplish these specific goals:

- Identify additional research needs
- Generate ideas for designers and facility managers to incorporate into practice
- Create market opportunities for the lighting industry
- Accelerate the rate of bringing lighting research into practice

The symposium was organized into two one-day sections. The first day dealt with research and what is being learned about people with older eyes and eye problems, and how light can be used to improve their vision, health, and well-being. The second day focused on how research may be applied to future lighting recommendations, designs, and products.

The final report includes the presentations of the speakers, the posters shown at the symposium, and a summary of our two days in Washington, DC along with potential action items to move the discussion forward.

For those that attended the symposium the final report will provide you with a useful summary to go along with your personal notes and experiences while you were there, and for those that were not able to attend the report will provide you with an overview of the conversations that occurred and hopefully pique your interest in the subject matter.

Thank you again for all those that attended, our partners/sponsors for their support and to all those that will read this final report and become inspired to lead the discussion in their communities about the importance of lighting quality for the aging eye.

2012 IES Research Symposium Steering Committee

**2012 IES RESEARCH
SYMPOSIUM STEERING
COMMITTEE**

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Eunice Noell-Waggoner
*Center of Design for an Aging
Society*

Frederick Oberkircher
*Emeritus Associate Professor –
Texas Christian University*

- 8:00am – 8:15am** **Welcome and Opening Remarks**
Kevin Flynn, FAIA, MIES, Kiku Obata & Company, Symposium Steering Committee Chair
- 8:15am – 9:00am** **Keynote Address**
 Aging Eyes: Light, Health and Well Being
Donald Kline, Ph.D., Professor Emeritus of Psychology and Surgery (Ophthalmology), University of Calgary
- 9:15am – 10:00am** **Vision Paper #1**
 Relationship Between Senior Visual Conditions and the Restraint of Technology
Robert Massof, Ph.D., Lions Vision Research and Rehabilitation Center, Wilmer Ophthalmological Institute at Johns Hopkins University
- 10:00am – 10:30am** **Speaker Q+A | Break | Posters**
- 10:45am – 11:30am** **Vision Paper #2**
 A Global Perspective: CIE TC3-44 Committee Findings & Recommendations
Yukio Akashi, Ph.D., University of Fukui, Chair of CIE TC 3-44, Lighting for the Elderly
- 11:45am – 12:30pm** **Vision Paper #3**
 Falls and Falls Prevention Related to Lighting
Jon Pynoos, M.C.P., Ph.D., UPS Foundation Professor of Gerontology, Policy, and Planning and Co-Director of the Fall Prevention Center of Excellence at the Andrus Gerontology Center, University of Southern California
- 2:15pm – 3:00pm** **Health Keynote**
 How the Biological and Behavioral Effects of Light Impact Human Health
George Brainard, Ph.D., Director of Light Research Program at Thomas Jefferson University
- 3:15pm – 4:00pm** **Health Paper # 1**
 Live to the Rhythm, Slave to the Rhythm
Eus van Someren, Ph.D., Head of the Department of Sleep and Cognition at the Netherlands Institute for Neuroscience
- 4:00pm – 4:30pm** **Speaker Q+A | Break | Posters**
- 4:45pm – 5:30pm** **Health Paper #2**
 Daylight Integration in Senior Living Design
Mary Alcaraz, PE, LC, CEM, LEED AP, IES, Principal, Ewing Cole
- 5:45pm – 6:30pm** **Health Paper #3**
 Measuring Circadian Stimulus and Dosage
Mariana Figueiro, Ph.D., Program Director, Associate Professor, Lighting Research Center - Rensselaer Polytechnic Institute

8:00am – 8:15am **Welcome Remarks**

8:15am – 9:00am **Keynote Address**

Moving from Research to Practice, Access to Care, Interventions, Public Policy
James W. Hunt, Jr., Ph.D., President and Chief Executive Officer of the Massachusetts League of Community Health Centers

9:15am – 10:00am **Session #1**

Improving Practice: Physical Changes in Housing Design for Seniors
Peter Hodgson, Architect, Thomas Pocklington Trust

10:15am – 11:00am **Session #2**

Regulatory Opportunities
Robert DuPuy, IALD, LC, Associate Principal, Lighting Studio Team Leader, Interface Engineering

11:00am – 11:30am **Speaker Q+A | Break | Posters**

11:45am – 1:00pm **Concluding Session**

What Do We Know...What Don't We Know...What Are We Going to Do?
Peter Boyce, Ph.D., Professor Emeritus at Rensselaer Polytechnic Institute



SYMPOSIUM POSTERS

The following posters will be presented at the Poster Sessions on

Tuesday, March 6th (10am-10:30am) and (4pm-4:30pm)

Wednesday, March 7th (11am-11:30am)

- P1** – Towards Brighter Luminous Indoor Environments
Liliana Beltran and Jialiang Wang, Texas A&M University
- P2** – Light Design to Improve Activity Levels of Older Adults with Dementia in a Nursing Home
Loek Canton, Delft University of Technology, The Netherlands
- P3** – Low Blue Light Devices Developed to Improve Sleep and Health
Edward Carome, Richard Hansler and Vilnis Kubulins, Lighting Innovations Institute, John Carroll University
- P4** – Simple Lighting to Improve the Quality of Senior Living Made Possible by New Lighting Technologies
Peping Dee, Inform LightWorks and Naomi Miller, PNNL
- P5** – The Behavioral Benefits of Proper Ambient Luminaire Layouts in Alzheimer’s Homes and Supplemental Light Therapy Administration
Laura Geiger, Architectural Engineering, Kansas State University
- P6** – Do Lighting Requirements Set Forth by the Agencies that Regulate Nursing Homes and Eldercare Facilities Meet the Industry ANSI/IES RP-28-07 Lighting Standards?
Asha Hegde, Texas State University – San Marcos

SYMPOSIUM POSTERS CONTINUED

- P7** – Therapeutic Optical Radiation for Seniors in Long-term Care
Michael Royer, Kevin Houser, Noel Ballentine, Paul Eslinger, Richard Mistrick, Richard Behr, Kirk Rakos, Andrea Wilkerson, Robert Bonneau, Penn State University and Penn State College of Medicine, Hershey Medical Center
- P8** – Visual Comfort Analysis in Assisted Living Facilities Using High Dynamic Range (HDR) Images Techniques
Jong Hoon Kim and Liliana Beltran, College of Architecture, Texas A&M University
- P9** – Positive Effects of Biologically Effective Light on Residents in Nursing Homes Suffering from Dementia
Dieter Lang, Osram AG, Peter Dehoff, Zumtobel, Dieter Lorenz, THM-University of Applied Science, Charlotte Sust, ABoVe GmbH
- P10** – Daylight Survey in Alzheimer’s/Dementia Care Facilities
Yadira Pagan-Fuentes, Oregon State University
- P11** – Study of Amber Colored Night Lights in an Assisted Living Facility
Mitzi Perritt, Stephen F. Austin State University, David Levine, Eunice Noell-Waggoner, Jeanne Halloin, Ray Darville
- P13** – Lighting and Daylighting for Independent Living: Improving Safety and Quality of Life in Existing and New Homes
Doug Walter, National Park Service and Bill Owens, Ohio Home Builders Association
- P14** – The Sleep Vision System
Greg Winchell, REB Technologies

SPEAKER BIOS



Yukio Akashi, PhD, University of Fukui, Chair of CIE TC 3-44, Lighting for the Elderly

Yukio Akashi graduated from the Tokyo Institute of Technology in 1985, upon which he joined Panasonic Corporation as a Senior Researcher. He subsequently served as a Research Assistant Professor and Senior Research Scientist at the Lighting Research Center, RPI. His current position is Associate Professor at the University of Fukui, Japan. He has received a number of awards, especially the Best Teacher of the Year (2009 and 2012), at the University of Fukui, Japan.



Mary Alcaraz, PE, LC, CEM, LEED AP, IES, Principal, Ewing Cole

Mary Alcaraz is an expert on sustainable lighting design having focused on creative and quality sustainable lighting design for her 20 year career with EwingCole, a leader in architecture, engineering and interior design in the United States, where she is a Principal. Having worked on diverse lighting projects in her career, she has completed daylighting projects in new construction for large healthcare and senior living clients, and is has completed a Daylight Harvesting study for over 14,000,000sf of existing facilities for government clients.

Mary is a Board Member of the Delaware Valley Green Building Council, the Charter High School for Architecture and Design and the Illuminating Engineering Society (IES) Philadelphia Section. She has published several articles including "Daylight on Display" (Lighting Design + Application), February 2008, and has been awarded numerous IES lighting awards for her projects.



Peter Boyce, PhD, Professor Emeritus at Rensselaer Polytechnic Institute

Peter Boyce is a fellow of both the Society of Light and Lighting, and the IES. He has spent most of his career working in the field of lighting. From 1966-1990 he was a Research Officer at the Electricity Council Research Centre in England. There, he conducted research on visual fatigue, the influence of age on visual performance, visual problems associated with viewing computer screens, hue discrimination, safe lighting for emergency conditions, and security lighting. From 1990–2004 he was Head of Human Factors at the Lighting Research Center at RPI. There, he conducted research on visual performance, visual comfort, circadian effects, emergency lighting, perceptions of safety, and lighting for driving and directed lighting evaluations and product testing. Since 2008 he has been the Technical Editor of the journal "Lighting Research and Technology". He has authored "Human Factors in Lighting" as well as numerous book chapters, papers and articles.

SPEAKER BIOS CONTINUED



George C. Brainard, Ph.D., Director, Light Research Program Professor at the Neurology Jefferson Medical College, and the Thomas Jefferson University Philadelphia, Pennsylvania

His academic work has been concerned with the effects of light on biological and behavioral responses of animals and humans for over thirty years. His research on the effects of light has been supported by grants from the National Institutes of Health, NASA, FDA, as well as Philips, OSRAM, Panasonic and other industrial and private sources. He has authored 90 original research articles and over 50 book chapters and edited 8 books or monographs including four lighting standards for the Illuminating Engineering Society.

Dr. Brainard chaired the IES Photobiology Committee for ten years, and is currently chair of the IES Light and Health Committee, and has been the Division Six Director for the International Commission on Illumination (USNC/CIE) since 1992.



Robert Dupuy, IALD, LC, Associate Principal, Lighting Studio Team Leader, Interface Engineering

During his 29 years of lighting design, Robert Dupuy has worked on almost every type of building from museums to hospitals, from embassies to theatrical retail. Trained as a theatrical lighting designer, Robert's architectural lighting is firmly rooted in an aesthetic of collaboration with a sensitivity to how people feel and use architectural spaces. Robert is especially interested and focused on America's growing population of older people. Robert applied this lifelong insight when he became one of the co-authors of the first comprehensive lighting regulation in the United States for nursing home residents. That document, adopted by the State of Oregon in 1992, formed the basis for his and others work in the creation of the Illuminating Engineering Society's Recommended Practice 28 which is recognized as the national standard for lighting for the elderly. His work with the State of Oregon he recently helped rewrite lighting requirements for memory care communities. Robert has a M.F.A. in lighting design from the University of Oregon, is an Associate Principal/Lighting Studio Leader with Interface Engineering in Portland, Oregon, and an Adjunct Professor at Marylhurst University.



Mariana Figueiro, PhD, LRC Light and Health Program Director and Associate Professor, Rensselaer Polytechnic Institute

She holds a bachelor's in architectural engineering from the Federal University of Minas Gerais, Brazil, and a master's in lighting and a doctorate in multidisciplinary science from Rensselaer. Her master's and Ph.D. dissertation research focused on the area of human circadian response to light. Figueiro is the recipient of the 2007 NYSTAR James D. Watson Award, the 2008 Office of Naval Research Young Investigator Award, and the 2010 Rensselaer Polytechnic Institute James M. Tien '66 Early Career Award for Faculty. She is former chair and current member of the IES Light and Human Health Committee.

SPEAKER BIOS CONTINUED



Peter Hodgson, Architect, Thomas Pocklington Trust

A chartered architect with 30 years experience of the UK social housing sector, Peter has worked for a number of housing associations in various development, technical and management roles, as well as in private practice. He started work as a consultant in 2002 and has subsequently undertaken projects for numerous housing associations, local authorities and private companies. Building on his interest in special needs housing, he currently provides Thomas Pocklington Trust with technical support for their research and lighting programs.



James W. Hunt, Jr., PhD, President and Chief Executive Officer of the Massachusetts League of Community Health Centers

As both a State and national leader on community based health care issues, Jim has helped to promote the value of health centers in improving access quality health care and in reducing cost across the health system. More recently, Jim has helped steer Massachusetts' health centers through the uncharted waters of health reform, where health centers are at the forefront of the Commonwealth's efforts to implement near-universal coverage for its residents.

Hunt is an adjunct professor at the Sawyer School of Management at Suffolk University. Among a list of recognition, Jim received a Honorary Doctorate in Humane Letters from the New England College of Optometry in 2002. And, in 2005, he was chosen as the first Geiger Gibson Distinguished Visitor in Community Health Policy at the George Washington University's School of Public Health and Health Services. The award is given to an individual who has exhibited extraordinary and sustained leadership in community health policy.



Donald Kline, Ph.D., Professor Emeritus of Psychology and Surgery (Ophthalmology), University of Calgary

After receiving the Ph.D. and completing a post-doctoral fellowship at the University of Southern California, Dr. Kline joined the faculty at the University of Notre Dame. He later became Department Head in Psychology at the University of Calgary, where he is now Professor Emeritus in both Psychology and Surgery (Ophthalmology). His interests include: 1) the neural and optical mechanisms that underlying visual aging, 2) how health, visual loss and eye surgery affect visual functioning, everyday tasks and quality of life, and 3) the use of image-processing to evaluate and enhance display legibility. He has been extensively involved in the application of vision science to enhancing driver and aircrew performance and safety through research, consulting, and his participation on national and international committees. He also serves as an expert witness/consultant for numerous legal cases regarding the visual aspects of worker, aircrew and driver performance and safety.

SPEAKER BIOS CONTINUED



Robert W. Massof, Ph.D., Professor of Ophthalmology and Professor of Neuroscience, Johns Hopkins University School of Medicine

He is founder and Director of the Lions Vision Research and Rehabilitation Center, a division of the Johns Hopkins Wilmer Eye Institute. Dr. Massof received his Ph.D. in Physiological Optics from Indiana University in 1975. His research areas include health outcomes measurements, clinical and basic vision psychophysics, physiological optics, and psychometrics. Dr. Massof is a Fellow of the Optical Society of America and has served on the Society's Board of Directors. He also is a Fellow of the American Academy of Optometry and the Association for Research in Vision and Ophthalmology. He has authored more than 175 published scientific papers and book chapters. He founded and directed a collaboration of The Johns Hopkins University, NASA, and the VA to develop the Low Vision Enhancement System, called "LVES" ("Elvis"). This work was recognized with numerous awards, including the Popular Mechanics Design and Engineering Award and the NASA Award for Excellence in Technology Transfer.



John Pynoos, M.C.P., Ph.D., UPS Foundation Professor of Gerontology, Policy, and Planning and Co-Director of the Fall Prevention Center of Excellence at the Andrus Gerontology Center, University of Southern California

Jon Pynoos is the UPS Foundation Professor of Gerontology, Policy and Planning at the Andrus Gerontology Center of the University of Southern California where he also co-directs the Fall Prevention Center of Excellence. His career has focused on improving housing, communities and services so that older persons can age in place. He has advocated for policy changes that facilitate home modifications in existing housing, the development of new housing based on principles of universal design, and elder friendly communities. He has written/edited over half a dozen books and frequently contributes to such journals as *Generations* and *Aging and Social Policy*. He teaches courses at Andrus on social policy and aging, housing, and developed its executive certificate program on home modifications. He was a delegate to the last three White House Conferences on Aging and has served as a member of the ABA Commission on Legal Problems of the Elderly as well as the California Commission on Aging.



Eus J.W. Van Someren, PhD, Head of the Department of Sleep and Cognition at the Netherlands Institute for Neuroscience and professor of Integrative Neurophysiology at the VU University, Amsterdam.

He focuses on the brain mechanisms underlying causes and consequences of disturbed sleep. The topic is addressed in a multidisciplinary approach, rooted in his diverse background that includes a training in physics, psychophysiology and neuropsychology, as well as a cum laude PhD in neurobiology from the faculty of medicine. His expertise covers sleep, circadian rhythms, cognition, aging, thermoregulation, brain imaging and ambulatory monitoring. He recently founded sleepregistry.org to acquire a database of sleep phenotypes.

LIGHT + SENIORS – A VISION FOR THE FUTURE IES RESEARCH SYMPOSIUM

March 2012

Symposium Committee Summary

A Research Symposium (March, 2012) entitled “LIGHT + SENIORS—A Vision for the Future” was organized by the Illuminating Engineering Society (IES) to foster discussion and report on ways that lighting can be used to maintain vision, mental and physical health, and quality of life for those with aging eyes. The goals of this and other IES research symposia are to:

- Identify additional research needs
- Generate ideas for designers and owners to incorporate into practice
- Accelerate the rate of bringing lighting research into practice
- Create market opportunities for the lighting industry

The symposium presentations were organized into two one-day sessions, the first day being devoted to research findings about people with older eyes and vision problems, as well as research about the connections between light and health. The second day focused on how research might be applied to future lighting recommendations, designs, and products. In addition to attending the research presentations, symposium participants had many opportunities interact with the speakers and to view and discuss research poster papers on a variety of topics related to lighting and the aging eye.

In the closing session of the symposium, participants discussed key learning impacts and debated paths forward, summarized here:

We know a vast amount about light and vision in interior spaces, due to years of extensive research, and therefore we know a great deal about the lighting conditions required for seniors to see in these interior spaces. There are several paths to implement what we already know:

- Work to exempt senior facilities from restrictive energy codes that limit the lighting power densities in buildings. Such restrictions tend to result in lower light levels, which can make visual tasks even more difficult for the senior population and says nothing about lighting quality. This work might be done by citizen advocacy and by developing partnerships between interested organizations.
- In states where requirements are mandated for senior facilities, work to have RP28 incorporated into these requirements. Such work would be accomplished through organizational or citizen advocacy.
- Provide information on good lighting practice for seniors – this can be done through publications (both printed and electronic) and through demonstrations on social media. This information will have to be designed to appeal to a number of specific groups, including ophthalmologists, architects, designers, occupational therapists, and outreach workers at community health centers .

For exterior conditions, there is still much to learn, as conditions (low light levels, very little contrast) are much more difficult. Research focusing on exterior conditions would be highly beneficial to seniors.

Universal design is a concept that appeals to many and that could be one solution to concerns for seniors. However, regarding lighting, is it possible to design lighting that is appreciated by all ages? It is certainly true that lighting that is good for seniors in terms of visual performance and visual comfort will also provide a high level of visual performance and visual comfort for the young, but will the young also like it or will it be identified as “lighting for the elderly?” Such a design question might well be addressed through a design competition.

There are two distinct groups of seniors-- those with healthy vision that may be worse than they had in their youth but are still functioning well and those who are partially sighted or blind. The former are likely to be more concerned with the appearance of the lighting than the latter while the latter are more likely to be more concerned with whether or not the lighting is effective in allowing them to see better than are the former. Treating all seniors as though they were partially sighted will produce resistance to change because seniors are not all the same in visual terms and those with good vision will not see any need for change. This distinction must be considered in future research and application efforts.

We do not know enough about the tasks that the two groups of seniors actually want to be able to do. We tend to presume we know, but we do not. We need some survey work to found out what matters to the two groups of seniors and to what extent lighting is important.

There are important differences to consider between new homes/facilities and existing buildings. In new construction it is relatively easy to introduce lighting specifically designed for seniors. For this designers and architects need to be educated about what is required. For retrofit, changing the lighting is much more difficult. Changing the lighting is therefore only likely to be attempted when visual abilities deteriorate rapidly. It would be interesting, and likely important to seniors who are “aging in place” in their own homes, to develop a kit of possible luminaires and changes that are inexpensive and easy to install, control and maintain.

Lighting is not the only thing that matters--décor is also important. The important principle is high contrast on salient detail. But not everyone appreciates high contrast, of either luminance or color. We know that low contrasts are very difficult for people with partial sight to see but do they need very high contrast or will a medium contrast do? These are questions that would benefit from more research.

Regulation is not likely to be the most effective path for lighting in senior facilities because there are no agreed-upon metrics to define the necessary light distribution and positioning of the luminaires for best results. One possibility is to examine the benefits of lighting designed with recommendations from IES RP-2807 in terms of ability to recruit residents – in other words, make an economic case.

Regarding the non-visual effects of light exposure, it was agreed that exposure to light can have beneficial effects on the treatment of specific diseases, such as Alzheimer’s disease. This is light as medication and has to be investigated by medically trained people using experimental techniques commonly used in medical research in order to be accepted. It was also agreed that it would be possible to identify, using circadian light monitors, light exposure conditions that lead to circadian disruption and poor sleep quality. While possible, there seemed to be little enthusiasm for this. More interest was expressed in the possibility of identifying the minimum amount of light exposure required for good health although this could be taken to be the light exposure that eliminated circadian disruption.

Can light exposure be established as a public health issue? There is some support for this given that air quality and noise have already been established as public health issues. However, to do this will require hard numbers to indicate the nature and scale of the problem. It may be that the work on exposure to light at night will raise this idea but, if so, it is likely to set maximum level of exposures rather than minima. Basically, we do not know enough about the positive and negative consequences of light exposure for human health. There is a lot of work to do in this area, but before it will get very far it will be necessary to reach international agreement on the spectral sensitivity of the circadian system so that the stimuli can be measured consistently.

What is needed from manufacturers?

- Light sources that are effective for both vision and circadian system and that do not have a cold visual appearance.
- Luminaires that provide the required light distribution without glare or flicker. Luminaire manufacturers should test their designs against a panel of seniors.
- Control systems that are simple to use by people with partial sight.
- Products that are affordable.
- Information that is easier to find about suitable luminaires, as well as a guide to find the luminaires themselves at retail locations.

What is needed from educators and researchers?

- From educators, to educate the next generation of architects and designers on the needs of seniors.
- From researchers, to continue the good work they have been doing for the last decade but particularly to identify how much light is required to stimulate the circadian system in the real world.

What is needed from designers?

- Some innovative designs for universal design installations
- Some new luminaires that are inexpensive but effective for those with partial sight.
- Some standard design solutions for retrofitting existing interiors.

What is needed from regulators?

- To remove restrictions on lighting power density for locations where seniors are present.
- If light exposure can be shown to be a public health issue to get it into regulations as required.
- To agree an international standard on the spectral sensitivity for circadian light.



**The following link at
<ftp://symp2012@71.190.247.118>
contains session handouts and posters
presented at the symposium. The pdfs
are in chronological program order by
session. Posters are numbered as noted
in the program document.
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