ERI InSights
The Eye Research Institute University of Wisconsin- Madison
June 2010

ERI UPDATES/ANNOUNCEMENTS

Welcoming New Members

Over the past few months, ERI members from additional departments and institutions have broadened vision connections and research dimensions under the Eye Research Institute umbrella—now numbering 80 members from thirty departments across three Wisconsin institutions, as well as additional community groups. We are pleased to introduce the following ERI members:

Members:
James Blanchard, PhD (Engineering Physics)
Kevin Eliceiri, PhD (Laboratory for Optical and Computational Instrumentation [LOCI]; Graduate School)
Theresa Kelley, PhD (English)
Bassam Shakhashiri, PhD (Chemistry)
Dietram Scheufele, PhD (Life Sciences Communication)

Associate Member:
Duska Sidjanin, PhD (Ophthalmology; Cell Biology, Neurobiology & Anatomy; Medical College of Wisconsin)

Successful Outreach Event at Henry Vilas Zoo!

Over ninety people joined Zoo staff and ERI presenters **Dick Dubielzig** (veterinary pathologist) and **Ellison Bentley** (veterinary ophthalmologist) for the May 23rd ERI and Zoo program, ***Vision at the Zoo: A Bird's Eye View.*** The featured birds— penguin, macaw and great horned owl—charmed adults and children alike, as attendees learned unique and intriguing facts about bird vision. WMTV Madison Channel 15 covered the event on its evening news report, a first for the ERI! VIDEO: Vision At The Zoo 5pm news 5/23/2010

Annual ARVO Meeting Draws ERI Members

Over thirty Eye Research Institute members presented their research at the Association for Research in Vision and Ophthalmology (ARVO) meeting early in May. Advancing both basic and clinical knowledge, ARVO serves as a leading international forum for vision research and is a major advocate for vision science worldwide. The research breadth of participating ERI members' posters, papers and special interest group presentations is evident in the list accessible at the ERI website: http://www.vision.wisc.edu/pdf/ARVO_2010_ERI_members.pdf

COMING EVENTS

2nd Annual Vision Science & Visual Art Poster and Gallery Session, Fall Semester 2010

While the exact date and location are in process of being finalized (think late September), let this serve as a reminder to save posters you may have presented since last fall's event!
In association with an invited guest speaker and an ERI membership meeting, this event provides an opportunity to showcase vision-related scientific research and artistic works, bringing together faculty and students with wide-ranging vision interests. Registration details and a "save-the-date" announcement will be publicized soon.

Poster and Gallery Session participation is encouraged for:
- Eye Research Institute members and associated scientists, researchers, postdocs, graduate students and advanced undergraduates
- Center for Visual Cultures members and associated graduate students, postdocs and advanced undergraduates
- other individuals with vision science or visual art interests

Work accepted for display:
- **posters** already prepared and previously presented at a recent conference OR
-new posters presenting work not previously shown [No abstracts required.]
- **visual art work** previously exhibited or new (any media, any format)

Awards for best student presentations will again be given.

FACULTY, STAFF & AFFILIATE ACCOMPLISHMENTS

Hartwell Foundation Funds Research Award to Neonatologist

De-Ann Pillers (Pediatrics) is the recipient of a Hartwell Foundation Individual Biomedical Research Award, which will provide research support of $100,000 per year for three years. She is one of ten individuals comprising the Hartwell Class of 2009, selected from twelve different institutions designated by the Hartwell Foundation as Top Centers of Biomedical Research in the United States. This kind of award is rare and much appreciated, because it supports science that is promising but not sufficiently advanced to qualify for federal support. Pillers will focus on identifying a novel genetic marker for the risk of premature birth that will aid in identifying at-risk pregnancies, with the goal that delaying the birth will greatly improve vision and other developmental outcomes. She will be studying the immune system of the amniotic sac that surrounds a baby *in utero*, looking for genetic risk factors that are predicted by the infant, rather than by the mother. Her Hartwell award offers the potential to speed the translation of basic science into new therapies to benefit children. Pillers expressed that her goal in joining UW as Chief of Neonatology was to develop and build a group with a focus on infant vision, and that as a vision scientist she feels the opportunity to be part of the ERI is invaluable in exposing her to the work of UW colleagues to help her identify areas of overlapping interest and for potential collaboration.

Shakhashiri Selected as ACS Officer Candidate

Bassam Shakhashiri (Chemistry) is one of two candidates nominated for 2011 President-elect of the American Chemical Society, one of the world's largest scientific societies. If elected in September by the general membership, Shakhashiri will serve as ACS president-elect in 2011, president in 2012, immediate past president in 2012, and will become the third UW-Madison faculty member to serve as ACS president (Farrington Daniels in 1953 and Charles P. Casey in 2004).

NSF CAREER Award Will Link Machine and Human Learning

Xiaojin (Jerry) Zhu (Computer Sciences) is the recipient of a 2010 Faculty Early Career Development Award (CAREER) from the National Science Foundation, a five-year grant designed to boost young faculty in establishing integrated research and educational activities while helping to address areas of important need. Zhu's CAREER project is titled "Using Machine Learning to Understand and Enhance Human Learning Capacity." His project aims to discover the common mathematical principles that govern learning in both humans and computers. Examples include rigorous generalization error bounds (how well can a student or a robot generalize what the teacher taught to new problems?); sparsity (how well can the student or robot identify a few salient features of a problem out of a haystack of irrelevant features?); and active learning (can the student or robot ask good questions to speed up its own learning?). Of particular interest to ERI members will be gaze tracking experiments to study human attention and learning strategies. He expects the project will lead to novel computational approaches to enhance human learning in and out of classrooms, and advance machine learning by incorporating insights on tasks where humans excel.

RESEARCH NEWS

Neural Progenitor Cells Can Rescue Vision

David Gamm (Ophthalmology & Visual Sciences) has successfully used a line of neural progenitor cells to halt photoreceptor dysfunction and loss as well as to rescue visual function in a mouse model of Usher's syndrome (a combined deafness and blindness disorder caused by mutations in several genes). Gamm and co-investigators used subretinal transplantation of progenitor cells in the Ush2a mouse to determine their effect on visual acuity and contrast sensitivity. They found that this treatment prevented functional deterioration of vision and led to recovery of a normal distribution of photoreceptor cells. Results are reported in the April issue of *Investigative Ophthalmology & Visual Science*, in "Cell transplantation to arrest early changes in an ush2a animal model." Gamm has used the same cell line previously to rescue vision in an animal model of retinitis pigmentosa, and has established a master cell bank (at the Waisman Center) that will be used to generate cells for future clinical trials in macular degeneration.

Neuroprotection from Pgamma Protein

Looking at the basic biology of visual signal transduction, the process by which incoming light is converted to neural signals passed to the brain, **Arnold Ruoho** and **Lian-Wang Guo** (Pharmacology) detail new insights into the molecular mechanisms that trigger this progression. When rhodopsin is activated in the photoreceptor rod cells of the normal mammalian retina, a protein referred to as Pgamma must be present. Without this protein the mammalian retina undergoes neurodegeneration. Their *Journal of Biological Chemistry* paper reports that the 87-amino acid-long Pgamma protein can simultaneously interact with two important partners involved in visual signal transduction – the rhodopsin activated G-protein, transducin, and the enzyme, PDE6, that regulates the levels of the second messenger, cyclic GMP. Their study identifies two regions of the Pgamma molecule that process the biochemical information inherent to the healthy mammalian retina. "Complementary interactions of the rod PDE6 inhibitory subunit with the catalytic subunits and transducin." 2010 May 14;285(20):15209-19. Epub 2010 Mar 15.

Is Memory Biased by Experience?

Learning from her past work that memory for locations can be distorted by the visual structure of the scene in which locations are presented, and that such memory distortions depend critically on visual input, **Vanessa Simmering** (Psychology) has been exploring

whether memory for visually-specified locations could also be influenced by a person's experience with locations over repeated trials. In a recall task, adults were asked to remember the locations of dots within a circular frame on a computer screen. Experimental results showed that their performance depended on the distribution of the locations within the session: memory on a given trial was "pulled" toward locations tested on other trials. Reported in the April issue of *Cognition* ("The role of experience in location estimation: Target distributions shift location memory biases"), study results advance our understanding of how people integrate multiple sources of information when interacting with the world around them. As an example, Simmering notes that in a familiar location people can find items quickly and accurately even when they are not in view. "You may easily retrieve your stapler from a desk drawer without looking to see where it is, or answer your phone as your eyes remain on your computer screen. If a colleague comes to borrow a book, you will strategically search the bookshelf or desk where you expect that book to be. All of these behaviors require integrating information about the visual scene, based on weeks and years of experience in that specific environment—but also grounded in a lifetime of perceiving, remembering, and interacting with objects around us." Research on simple location memory tasks can help explain how these sources of information are identified, remembered, and integrated in the service of behavior.

Comparative-Effectiveness Study Confirms New Treatment for Diabetic Macular Edema

Researchers have recently shown that ranibizumab (Lucentis) eye injections, often in combination with laser treatment, result in better vision than laser treatment alone for diabetes-associated swelling of the retina. The article titled "Randomized Trial Evaluating Ranibizumab Plus Prompt or Deferred Laser or Triamcinolone Plus Prompt Laser for Diabetic Macular Edema" published online in *Ophthalmology* (April 27, 2010), was authored by the Diabetic Retinopathy Clinical Research Network (DRCR.net). ERI member **Justin Gottlieb** (Ophthalmology & Visual Sciences) chaired the University of Wisconsin clinical site for this study, supported by the National Eye Institute and the National Institute of Diabetes and Digestive and Kidney Diseases. The study is still ongoing, but investigators found the early results of treatment with ranibizumab to be so significant that they are now recommending eye injections of the drug – in conjunction with early or deferred laser treatment – for all patients with characteristics similar to those in the clinical trial.

NIH Supports Eye Movement Studies to Understand Selection and Choice

Two new grants have been awarded to **Michele Basso** (Physiology) to explore how the brain makes choices about where to look. Preliminary data collected by graduate student Corinne Vokoun, while supported by an ERI Rapid Response Initiative grant to Basso and Meyer Jackson, provided the basis for NIH funding of "An *in vitro* Model of Saccades and Choice" for co-PIs Basso and Jackson. Vokoun introduced an entirely new technique for studying the role of the superior colliculus in eye movement control, focusing on visualizing population dynamics within this area of the brain by using voltage imaging. Their study aims to explore *in vitro* how population dynamics in the superior colliculus—considered part of the final motor pathway for voluntary and reflexive saccades—underlie behavior, revealing new insights into how brain circuits direct decisions and cognition. The second NIH-funded project, titled "A Probabilistic Strategy for Understanding Movement Selection and Choice," seeks to develop a computational model to read-out multiple neuron activity from multiple brain areas simultaneously in order to predict eye movement choices made by non-human primates in a complex decision-making task. Both studies will augment understanding of the brain pathways and circuits underlying abnormalities in eye movements often associated with neurological diseases such as schizophrenia, autism, attention deficit disorder and Parkinson's disease, and may lead to better diagnostics and therapies.

NEW PUBLICATIONS/CURRENT LITERATURE

These are among recent publications by ERI members, including Epubs and print publications from March 31, 2010 to May 26, 2010. The list is organized alphabetically by first-listed ERI author name, highlighted in bold. As we do not have full access to all publication resources for each discipline, we may have missed one of your publications. If so, please accept our apologies and send us your citations for inclusion in the next issue.

Hwang FS, Neekhra A, Lucarelli MJ, Warner TF, Snow SN, **Albert DM.** Sebaceous cell carcinoma of the eyelid: a rapidly enlarging lesion with massive xanthogranulomatous inflammation. Ophthal Plast Reconstr Surg. 2010 May-Jun; 26(3):208-10.

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Diabetic Retinopathy Clinical Research Network (UW members who participated in protocol: **Gottlieb J, Blodi BA, Ip MS, Danis RP**). Randomized trial evaluating ranibizumab plus prompt or deferred laser or triamcinolone plus prompt laser for diabetic macular edema. Ophthalmology. 2010 Apr 22. [Epub ahead of print]

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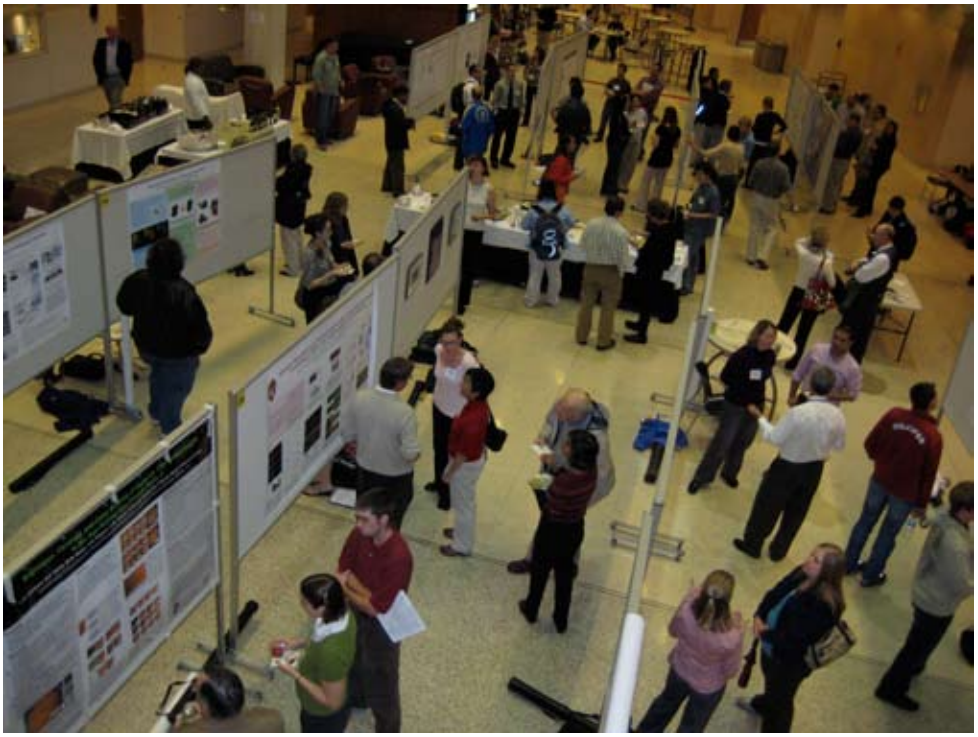
We invite your feedback on this newsletter for the ERI membership.
Please respond with comments at: InSights Feedback



2009 ERI Vision Science and Visual Art Poster/Gallery Session
Watch for details about the 2nd Annual Poster/Gallery Session in Fall 2010!

About ERI *InSights*

The UW Eye Research Institute will distribute InSights every other month. Its purpose is to build ERI community, advancing member connections and collaborations by sharing research and educational activities as well as member accomplishments and honors (including those of their lab associates and students). We welcome news of research advances, scholarly publications, grant awards, educational and professional honors, available lab positions, or shared equipment/services. If you have an item you wish to submit for possible inclusion, please send it to Gail Stirr at gmstirr@wisc.edu

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