

Leading with Vision

Today's scientific discoveries are increasingly made through partnerships between an assortment of scientists and scholars. Enhancing the interplay between different disciplines broadens the base of scientific knowledge and fosters new and innovative ways of thinking.

"Building connections between these scientists and scholars requires an organizational structure focused on interdisciplinary relationships," says **Daniel Albert**, Director of the UW Eye Research Institute (ERI) and Professor of Ophthalmology and Visual Sciences. "The ERI is one of the newest institutes on campus, and its members are committed to expanding opportunities for vision science research and education across campus."

The Leadership Committee is the governing "backbone" of the Institute, representing the different UW schools and colleges of participating ERI scholars. The interests, diversity and energy brought to the ERI through the inaugural Leadership Committee are highlighted in the profiles below.

In a laboratory focusing on studies of animal-bacterial interactions, **Margaret McFall-Ngai**, Professor of Medical Microbiology and Immunology, became interested in how tissues that interact with light are designed through evolution. She studies a nocturnal squid that collects light-producing bacteria into its "light organ," or *photophore*, to find out what effects the bacteria has on its host. "Photophores and eyes come from very different tissues as an embryo develops, but they converge in structure, anatomy, biochemistry, and in other ways," she says. "These similarities and differences can teach us something about how organisms use light and vision."

McFall-Ngai says that she joined the ERI Leadership Committee because she sees an opportunity to create a "new type of eye institute." She explains, "The UW Eye Research Institute is poised to be the frontrunner in a new generation of insti-



Clockwise from top: Margaret McFall-Ngai, Christopher Murphy, and Nansi Jo Colley



tutes that will integrate other fields, such as the arts, engineering, and math."

"I was struck by the idea that this Eye Research Institute would take the entire campus into consideration to create an entity that enhances the outcome for all vision science," says **Christopher Murphy**, Professor of Comparative Ophthalmology in the School of Veterinary Medicine. "This group will be the voice of the visual sciences on campus, a portal for funding, and a home where collegial relationships with others interested in the field can be developed."

Murphy, a veterinary ophthalmologist, studies corneal wound healing, how cells react to the surfaces they sit on, and how animals have evolved unique optical adapta-

tions for optimizing their visual performance under challenging environmental conditions.

Like Murphy and McFall-Ngai, **Nansi Colley**, Professor of Ophthalmology & Visual Sciences, is intrigued with how different organisms have evolved to use light. She uses clues from her research in the common fruit fly to investigate genetically relevant human diseases, like macular degeneration.

"I resonate with the Institute's mission of bringing the campus researchers together with people in the community who are interested in vision and blinding disorders," states Colley. "There is great potential for new partnerships with community organizations interested in vision, and for sharing collaborative and educational resources."

Richard Dubielzig, Professor of Pathobiological Sciences in the School of Veterinary Medicine, has a career-long interest in comparative eye pathology. Receiving eye specimens from veterinarians around the country, he performs diagnostic microscopic analysis to aid in the animal's treatment. He also maintains a large collection of slides and eye specimens for comparative studies and eye research.

Dubielzig sees a role for the ERI in bringing together groups with markedly different interests, so that all could benefit from exposure to the work of other laboratories. "For example," he says, "I could see the veterinary mail-in pathology service being done in an environment where human eye pathology, state-of-the-art imaging, and studies of ocular evolution and comparative physiology also take place. Such an atmo-



Clockwise from top: Shiela Reaves, Richard Dubielzig, and Rick Cai

sphere has the potential to inspire and enlighten each of these fields.”

“Visual sight is a blessing, yet seeing the ordinary world in greater detail through the eyes of trained photographers and artists can provide a completely different and enhanced experience,” **Shiela Reaves**, Professor of Life Sciences Communication, remarks. “But we also need to be aware of changing media technology to understand how images can be altered to mislead.” Reaves’ research involves the ethics of computer manipulation of images, particularly photos of fashion models, and how the stylized physical attributes presented in the media affect today’s youth.

Reaves envisions the Eye Research Institute as a means of knitting the work of social scientists such as herself together with that of laboratory scientists. “I think the Institute is unique in its ability to nurture a conversation among scientists, media scholars, and others in the humanities. It’s a place where ideas will be enriched by this cross-pollination.”

Rick Cai, Assistant Professor of Psychology, echoes the idea of cross-fertilization, noting that in the case of the Eye Research Institute, “One-plus-one becomes greater than two. It is wonderful to form a community of people with similar intellectual interests, yet with different approaches.”

Cai studies the visual cortex, the part of the brain responsible for processing visual information, focusing on how conscious experiences arise from brain activity. He says, “I study the human visual

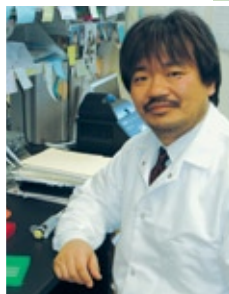
system to explore why we experience the world in concrete ways, through perception of space, time, and other factors. How does our brain create these basic building blocks of perception, and what is the relationship between ‘looking’ (the eye system) and ‘seeing’ (the entire visual system, including the brain)?”

In a similar vein, **Akihiro Ikeda**, Assistant Professor of Genetics, is interested in how visual information is transmitted and researches neural synapses, the minute spaces across which nerve impulses travel. Using a mouse model, he investigates how synaptic interactions are developed and maintained.

“The Eye Research Institute has the potential to provide educational opportunities for the general public to learn about vision, vision research, and related diseases,” says Ikeda. “I wanted to participate in the Institute to meet others who study vision from different perspectives, and to find better ways we can share information about vision research and its possibilities with the public.”

“The UW has a great tradition of community outreach and education, as well as forging business and research relationships throughout the state,” adds **Nicola Ferrier**, Associate Professor of Mechanical Engineering. “It’s known as the ‘Wisconsin Idea’ and it is a tradition that the Eye Research Institute strives to follow.”

From top: Charles Dyer, Akihiro Ikeda, and Nicola Ferrier



Ferrier builds artificial vision systems for use in robots, machinery and devices, many of which have applications for use in animal and human vision systems. She finds personal satisfaction in working with vision researchers “because the engineering work we are doing often has an immediate, positive impact on correcting or diagnosing human visual problems.”

Charles Dyer, Professor of Computer Sciences, expresses a parallel perspective. “In my field of computer vision and image analysis, I design automated ways of analyzing the content of digital images. This work will contribute to a better understanding of human vision, can help solve other important problems ranging from robotic navigation to diagnostic systems, and has useful applications for medical image analysis.”

Dyer, too, expresses the importance of taking the work of Eye Research Institute members off campus. “Wherever there are important societal or medical problems that require the analysis of digital images, there are opportunities for outreach or partnership with industry.”

Summing up the perspectives of his Leadership Committee colleagues, Eye Research Institute Associate Director **Arthur Polans**, Professor of Ophthalmology and Visual Sciences, says, “The UW Eye Research Institute will foster the development of new knowledge about normal vision and eye diseases. It will also advance new technologies and promote the rapid application of innovative approaches to significant healthcare issues through partnerships between the remarkable scholars on this campus.”



THE UNIVERSITY
of
WISCONSIN
MADISON

The UW Eye Research Institute
445 Henry Mall #307
Madison, WI 53706
608/265-0690
info@vision.wisc.edu
vision.wisc.edu