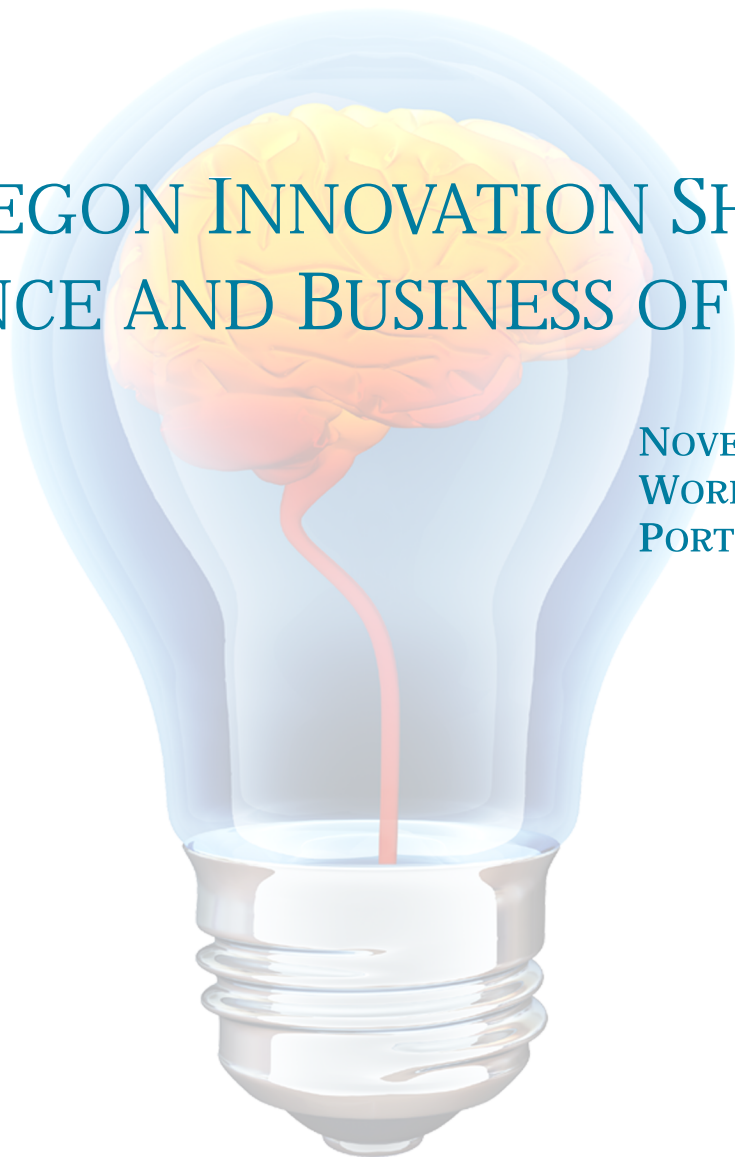




Innovate | Collaborate  
OREGON

# 2009 OREGON INNOVATION SHOWCASE: THE SCIENCE AND BUSINESS OF THE BRAIN



NOVEMBER 3, 2009  
WORLD TRADE CENTER  
PORTLAND, OREGON

## EVENT SPONSORS

**Bend Research Inc.**  
Innovators In Pharmaceutical And Health Science Technologies

**S&W** | SCHWABE, WILLIAMSON & WYATT®  
ATTORNEYS AT LAW

**MOSS ADAMS** LLP

 Oregon Bioscience  
Association

**PORTLAND  
BUSINESS  
JOURNAL**

INNOVATE | COLLABORATE | OREGON

WWW.ICOREGON.NET

A PARTNERSHIP OF:

 UNIVERSITY OF OREGON

 OREGON  
HEALTH & SCIENCE  
UNIVERSITY

 Portland State  
UNIVERSITY

Oregon State  
UNIVERSITY **OSU**

# INNOVATION SHOWCASE

## AGENDA

- 2:00 PM WELCOMING REMARKS  
**John Kroger, Oregon Attorney General**
- 2:15 PM SHOWCASE PRESENTATIONS  
**Dennis Bourdette, MD - Oregon Health & Science University**  
*Challenges and Opportunities in Biotechnology: Lessons from Developing New Therapies for MS*  
**APDM, Inc.: Mateo Aboy, PhD - Exec. VP, CIPO, CFO**  
*Inertial Sensors for Monitoring Parkinson's Disease*  
**Joseph Beckman, PhD - Oregon State University**  
*New Insights into Lou Gehrig's Disease using Mass Spectrometry*  
**FEI Company, Inc.: Ben Lich - Product Marketing Manager**  
*3D Electron Microscopy Requirements for Understanding Connectivity in Brain Tissue*
- 3:15 PM REFRESHMENT BREAK
- 3:35 PM KEYNOTE PRESENTATION  
**Larry Sherman, PhD, Oregon Health & Science University**  
*Music and Myelination: Strategies to Improve Brain Repair in Health and Disease*
- 4:30 PM SHOWCASE PRESENTATIONS  
**Shawn Lockery, PhD - University of Oregon**  
*Caught in the Act: Neuronal Analysis of Behavior in the Nematode*  
**Electrical Geodesics, Inc.: Ann Bunnenberg, PhD, JD - President**  
*Breaking the Silos: Bringing Advanced Functional Imaging to the Sleep Market*  
**Rik Lemoncello, PhD - Portland State University**  
*Assistive Technology for Brain Injury Survivors*
- CLOSING REMARKS
- 5:30 PM RECEPTION AND POSTER SESSION

# DENNIS BOURDETTE, MD

DENNIS BOURDETTE, MD  
CHAIR, DEPARTMENT OF NEUROLOGY, OHSU

*Challenges and Opportunities in Biotechnology: Lessons from Developing New Therapies for MS*

**Dennis Bourdette, MD** is Chair and the Roy and Eulalia Swank Family Research Professor of the Department of Neurology and Director of the OHSU Multiple Sclerosis Center. Dr. Bourdette is also the Co-Director of the Department of Veterans Affairs Multiple Sclerosis Center of Excellence-West. Dr. Bourdette graduated with a medical degree from the University of California at Davis and received his B.A. in Biology from the University of California at San Diego. He completed his neurology residency at Oregon Health Sciences University and his Neuroimmunology Fellowship at the Portland Veterans Affairs Medical Center.

Dr. Bourdette is a member of the American Neurological Association and a Fellow of the American Academy of Neurology, and was instrumental in the establishment of the OHSU Brain Institute in the fall of 2006. Recently, Bourdette and his colleagues have been researching a new therapy for MS that would protect nerve fibers from degeneration.

# APDM, INC.

APDM, INC.

MATEO ABOY, PHD - EXEC. VICE PRESIDENT, CIPO, CFO

*Inertial Sensors for Monitoring Parkinson's Disease*

**APDM** specializes in developing superior technologies for clinical assessment of movement disorders such as Parkinson's disease. APDM's innovative solutions can be used in clinical trials to produce more precise outcomes that result in shorter trials with fewer subjects and lower cost. They can also be used during routine clinical assessment to help optimize therapy for individuals, and to support advanced research in movement disorders. APDM's mission is to develop innovative solutions to improve the quality of life for people with movement disorders.

**Mateo Aboy, PhD** is an Associate Professor of Electrical Engineering at Oregon Institute of Technology. He also holds a Joint Appointment in the Division of Biomedical Engineering at OHSU where he teaches doctoral courses in biomedical signal processing. His educational background includes BS degrees in Electrical Engineering, Physics, and Telecommunications Engineering; a MS in Electrical & Computer Engineering; a MS in Telecommunications Engineering, and a PhD in Electrical Engineering. He completed the Executive Certificate in Management & Leadership at MIT Sloan, and is a Licensed Patent Agent with a Bar Admission to practice patent law before the United States Patent Office.

# JOSEPH BECKMAN, PHD

## JOSEPH BECKMAN, PHD

PROFESSOR, DEPT. OF BIOCHEMISTRY AND BIOPHYSICS - OSU

*New Insights into Lou Gehrig's Disease using Mass Spectrometry*

**Joseph Beckman, PhD** is the Ava Helen Pauling Chair at the Linus Pauling Institute and a professor in the Oregon State University Department of Biochemistry and Biophysics. He also serves as the Director of the Environmental Health Sciences Center sponsored by the National Institute of Environmental Health Sciences. One of the world's leading authorities on Lou Gehrig's disease, Dr. Beckman has built a strong research program focused on the role of oxidative stress, antioxidants, and dietary factors in neurodegenerative diseases. He discovered the biological oxidant peroxynitrite and the amino acid modification nitrotyrosine.

Dr. Beckman received a master's degree in population biology from the University of Colorado in 1977 and a doctorate in plant physiology and biochemistry from Duke University in 1984. He was an established investigator for the American Heart Association, and currently holds grants from the National Institutes of Health and the ALS Association to investigate the molecular mechanisms underlying Lou Gehrig's disease.

# FEI COMPANY, INC.

## FEI COMPANY, INC.

**BEN LICH - PRODUCT MARKETING MANAGER**

*3D Electron Microscopy Requirements for Understanding Connectivity in Brain Tissue*

**FEI** is the premier provider of 3D ultrastructural imaging solutions for the life sciences. With a 60-year history of technological innovation and leadership, FEI has set the performance standard in transmission electron microscopes (TEM), scanning electron microscopes (SEM) and DualBeams™, which combine a SEM with a focused ion beam (FIB).

FEI's solutions are used extensively in life science applications to explore biological systems, from molecules to tissues, with significant emphasis on determining the three dimensional structure of proteins and viruses using cryogenic sample preparation techniques.

FEI has approximately 1,800 employees and sales and service operations in more than 50 countries around the world. More information can be found at: [www.fei.com/LifeSciences](http://www.fei.com/LifeSciences).

**Ben Lich** received his master's degree in optical engineering from University Twente in 1993. Ben joined FEI Company in 2000 and has worked in various product marketing roles. He is currently the Product Marketing Manager for the DualBeam products with the goal of developing new applications in the life sciences with suppliers, leading scientific institutes and partner companies.

# LARRY SHERMAN, PHD

## LARRY SHERMAN, PHD SENIOR SCIENTIST, ONPRC - OHSU

*Music and Myelination: Strategies to Improve Brain Repair in Health and Disease*

**Larry Sherman, PhD** received a B.A. and M.A. in Biology from Reed College and a Ph.D. in Cell Biology from OHSU. After three years of post-doctoral research at the Institute for Genetics in Karlsruhe, Germany, he joined the faculty at the University of Cincinnati, College of Medicine. He returned to Portland seven years ago and is now a Senior Scientist in the Division of Neuroscience at the Oregon National Primate Research Center and a Professor in the Department of Cell and Developmental Biology and the Neuroscience Graduate Program at OHSU.

Dr. Sherman has over 60 publications in the areas of nervous system development, neurodegeneration, and neuro-oncology, with a focus on ways to promote the repair of brain white matter in patients with multiple sclerosis and during normal aging. He serves on numerous national and international scientific panels and grant review committees and is the President of the Oregon Chapter of the Society for Neuroscience. He gives numerous public lectures on a wide variety of neuroscience-related topics each year and works with school children in the Portland area to help them develop science fair projects and to promote science education. He has played piano since the age of four, and has been in numerous blues, rock and jazz groups.

# SHAWN LOCKERY, PHD

## SHAWN LOCKERY, PHD PROFESSOR OF BIOLOGY - UO

*Caught in the Act: Neuronal Analysis of Behavior in the Nematode*

**Shawn Lockery, PhD** holds a B.A. in Philosophy from Yale University and did his graduate studies in neurobiology at Oxford University and U.C. San Diego. As a postdoctoral researcher at the Salk Institute he investigated the relationship between artificial neural networks and their biological counterparts. He is currently Professor of Biology at the University of Oregon and Associate Director of the Institute of Neuroscience.

Dr. Lockery's research seeks universal principles underlying the neuronal control of behavior through analysis of the nervous system of the microscopic round worm *Caenorhabditis elegans*, which has one of the smallest brains known to science. His laboratory was the first to make electrical recordings from the tiny neurons of this organism. More recently, he has been developing microfluidic devices for simultaneous imaging of neuronal activity and behavior. He is the recipient of numerous awards including an NIH Career Development Award, a Guggenheim Fellowship, and an NIH Challenge Grant. He is a member of the Society for Neuroscience, the Society for Neuroethology, and the Eugene City Barnstormers String Band.

# ELECTRICAL GEODESICS, INC.

## ELECTRICAL GEODESICS, INC.

ANN BUNNENBERG, PHD, JD - PRESIDENT AND CO-FOUNDER

*Breaking the Silos: Bringing Advanced Functional Imaging to the Sleep Market*

**Ann Bunnenberg, PhD, JD** is the President and Co-Founder of **Electrical Geodesics, Inc.**, a Eugene, Oregon-based company that develops, manufactures and markets functional imaging technologies for medical, neuroscience research and human performance evaluation worldwide. These EGI products are used to image changes in the functioning of the human brain for such diverse medical applications as epilepsy evaluation, neonatal intensive care, digital EEG, and stroke.

Ann received both her PhD and JD from the University of Oregon. In addition to her work with EGI, Ann is a business attorney with over 20 years experience in representing clients in the health care and medical software industries.

# RIK LEMONCELLO, PHD

## RIK LEMONCELLO, PHD

ASSISTANT PROFESSOR OF SPEECH & HEARING SCIENCES - PSU

*Assistive Technology for Brain Injury Survivors*

**Rik Lemoncello, PhD** is an Assistant Professor of Speech & Hearing Sciences at Portland State University as well as Principal Investigator with Personal Technologies, LLC on an assistive technology research grant. He has over ten years of clinical experience as a Speech-Language Pathologist working in a variety of medical settings with survivors of traumatic brain injury, stroke, anoxia, brain cancer, and myriad progressive and non-progressive neurological diseases.

Dr. Lemoncello's areas of research interest and expertise are in cognitive rehabilitation for acquired brain injury in adults, development and evaluation of assistive technologies for cognition, and development and dissemination of evidence-based practice guidelines. His current interdisciplinary research evaluates functional outcomes of reminders and therapy delivered on a person's home television.

# INNOVATION SHOWCASE 2009: POSTER PRESENTATIONS

## OREGON HEALTH & SCIENCE UNIVERSITY

### **NOVEL SPATIAL MEMORY TEST FOR HUMANS: MEMORY ISLAND**

*Gwendolen E. Haley, Ted Benice, Brian Piper, Jacob Raber*

Reduced spatial memory is observed in healthy aging and neurodegenerative conditions such as Alzheimer's disease, as well as following environmental challenges such as traumatic brain injury, brain irradiation, chemotherapy for cancer treatment, in utero exposure to drugs of abuse such as methamphetamine or other environmental toxins. Traditionally, assessment of spatial memory has been part of behavioral tests for rodents but not for humans, partly due to lack of an appropriate testing arena, making translational research difficult. Memory Island, a virtual reality maze, bridges the gap in research between species by creating an appropriate testing arena for human spatial memory, making cross-species comparisons possible and allowing assessments of spatial memory for diagnostic purposes and to assess treatment responses.

### **EARLY DETECTION OF COGNITIVE DECLINE WITH AGING AND ALZHEIMER'S DISEASE: THE NOVEL IMAGE / NOVEL LOCATION TEST FOR HUMANS**

*Gwendolen E. Haley, Ted Benice, Brian Piper, Jacob Raber*

Early detection is needed if we hope to treat aging and Alzheimer's disease-related cognitive problems. The Novel Image/Novel Location test designed by our laboratory adds increased sensitivity to traditional object recognition tasks through a new spatial component and could allow for home-monitoring of cognitive decline through a computer interface. Recent results provide evidence for increased sensitivity to detect cognitive changes.

### **CHANGES IN TURNING DURATION IS A SENSITIVE MARKER OF DISEASE PROGRESSION IN EARLY PARKINSON'S DISEASE**

*Arash Salarian, Cris Zampieri, Patricia Carlson-Kubta, Kamiar Aminian, Fay B. Horak*

Changing direction while walking often leads to freezing and falls in severe Parkinson's disease, but it is not known if turning difficulty starts early in the disease, before balance and gait difficulties are apparent. Twelve subjects with Parkinson's disease, who had never taken anti-Parkinson's medication, and 14 healthy control subjects were tested while wearing an inertial sensor system. Sensors, with 1 or 2D gyroscopes and 3D accelerometers, were placed on the torso and limbs to record motion during straight walking and turning. The turn duration was the most sensitive measurement to separate the Parkinson's subjects from control subjects and to track progression over 18 months.

### **VALIDATION OF TRACE AMINE-ASSOCIATED RECEPTOR 1 AS A MOLECULAR TARGET OF METHAMPHETAMINE'S ACTIONS**

*Edmund A. Reese, Katherine L. Suchland, Rachel Clemens-Grisham, James R. Bunzow & David K. Grandy*

Trace amine-associated receptor 1 (TAAR1) is a G-protein coupled receptor that stimulates cAMP production when activated by the trace amines beta-phenylethylamine (PEA) and para-tyramine (TYR), biogenic amines chemically related to the neurotransmitters dopamine, norepinephrine and epinephrine as well as the psychostimulants amphetamine (AMPH) and methamphetamine (METH).

Here we investigated whether TAAR1 represents a novel mediator of METH's effects in vitro using site-specific mutagenesis and computer modeling. Our results validate TAAR1 as a novel mediator of AMPH and METH's actions thereby justifying further consideration of this receptor as a target for anti-METH drug development.

# INNOVATION SHOWCASE 2009: POSTER PRESENTATIONS

## INTELLIGENT SYSTEMS FOR DETECTION OF AGING CHANGES

J.A. Kaye, L. Boise, E. Dishman, W. Guo, T.L. Hayes, D. Howieson, H. Jimison, M.Pavel, K. Wild, D.Williams, T.A. Zitzelberger

Cognitive impairment in the elderly often goes undetected or treated due to a failure to assess the patient in a timely manner. Evolving sensor and other technologies now provide a means of early detection and intervention minimizing morbidity and cost. We hypothesized that integrated, continuous and unobtrusive home monitoring of activity (motor and cognitive) could detect transitional or early signal events important for maintaining cognitive and physical health. Outcome measures include total daily activity, walking speed, weekly hours of computer use, and inter-keystroke interval.

## TOLL- LIKE RECEPTOR 3: A PROMISING NEW TARGET TO PROTECT THE BRAIN FROM ISCHEMIC DAMAGE

*Amy E. B. Packard*, Brenda Marsh, Susan L. Stevens and Mary P. Stenzel-Poore

Ischemic tolerance is a phenomenon whereby preconditioning with a small dose of an otherwise harmful stimulus can protect against damage caused by a subsequent ischemic challenge. We have found that preconditioning with the TLR3 ligand Poly I:C confers neuroprotection in both an in vitro model of stroke and a middle cerebral artery occlusion stroke model in mice. Additionally, TLR3 plays a protective role in the body's endogenous response to ischemia a unique trait among other TLRs that have been tested. TLR3 promises to be a valuable tool for elucidating the mechanisms of stroke damage and TLR-mediated neuroprotection.

## INTERNALIZATION AND TRAFFICKING OF SEROTONIN RECEPTOR COMPLEXES VISUALIZED USING QUANTUM DOTS

Katye M. Fichter, Marc Flajolet, Paul Greengard, *Tania Q. Vu*

Serotonin receptor signaling plays a central role in mediating key neurological functions in health and disease, including pain, anxiety, and depression. To examine the dynamics of 5-HT-receptor internalization and trafficking, we used quantum dot (QD) probes to label and detect individual and small numbers of receptors. Our data demonstrate that QD probes can be used to label and track 5-HT receptors with little or no effect on the native internalization behavior of the receptors. Immunocytochemistry experiments have been used to localize receptors to specific endosomal compartments, giving a much more complete picture of the endocytic trafficking pathways of 5HT receptors. These studies build the framework of native 5-HT receptor trafficking, which can then be used as a comparison for future work in developing drug therapies.

## ADAPTIVE COMPUTER GAMES FOR COGNITIVE MONITORING IN THE HOMES OF OLDER ADULTS

*James McKanna*

Standard cognitive screenings are usually performed only at advanced age or if there are already patient or family concerns about cognitive dysfunction. More complete neuropsychological assessments can be performed to obtain more sensitive diagnostic information, but are extremely expensive and time consuming for screening purposes. To address this issue, we have developed an inexpensive approach to embedding elements of standard neuropsychological tests into computer games that are enjoyable for elders to play on a routine basis. These embedded metrics include measures of working memory, divided attention, planning, and verbal fluency. Trends in these measures offer the possibility of detecting cognitive changes at an earlier point in time. Additionally, within-subject trends are less susceptible to biases due to educational level, language proficiency, and cultural background.

# INNOVATION SHOWCASE 2009: POSTER PRESENTATIONS

## THE OREGON BRAIN BANK: A RESOURCE FOR NEUROSCIENCE RESEARCH

Randall Woltjer

The Oregon Brain Bank has been in existence since 1989 and in that time has archived tissue from more than 1800 brain autopsies performed at OHSU. Relatives of donors have given consent for the use of these tissues for research purposes. Investigators are encouraged to contact the staff of the Oregon Brain Bank to discuss the goals of their research and how they might be facilitated by studies of diseased and control human tissues from this tissue bank.

## EARLY DETECTION OF COGNITIVE DECLINE VIA MONITORING NATURAL COMPUTER INTERACTIONS

William Hatt

Cognitive performance is a key health concern of elders who are at risk for cognitive decline. The goal of this project has been to develop unobtrusive measures to monitor cognitive performance and potentially predict decline using information from routine computer interactions in the home. Metrics include trend measures of overall computer activity, typing speed, mouse movements, text linguistic complexity, and performance on adaptive computer games. Early detection of cognitive decline offers the potential for intervention at a point when it is likely to be more successful.

## INTERACTIVE TECHNOLOGY FOR COGNITIVE HEALTH COACHING

Holly Jimison

Maintaining cognitive health is often the most important factor in remaining independent and being able to age in place. Our Cognitive Health Coaching Project provides a platform for delivering a multi-pronged set of cognitive intervention to older adults in their home environment. The interventions include adaptive cognitive computer games, novelty exercises, sleep management, physical exercise, and Skype videoconferencing for socialization. The coaching platform allows a single health coach to manage a large panel of patients using a system that collects monitoring data from the home and creates automated tailored feedback messages to help participants adhere to weekly cognitive health goals.

## PORTLAND STATE UNIVERSITY

## BRAIN- AND NATURE-INSPIRED INTERCONNECTS FOR EMERGING COMPUTING ARCHITECTURES

Christof Teuscher

Our research focuses on disruptive new computing paradigms and machines to meet the information technology challenges in the next 10-20 years. Here we present a novel nature-inspired interconnect approach that is based on unstructured, self-assembled nano-wires. Using a simulation framework, we show that such interconnects can have major advantages over traditional interconnects in terms of cost, performance, and robustness.

## NEURAL ENCODING OF BULK WATER FLOW IN THE MIDBRAIN OF THE GOLDFISH (CARRASIVUS AURATUS)

Volker Hofmann, *Randy Zelick*, Horst Bleckmann

The lateral line is a mechanosensory system found in all fish and aquatic amphibians. Much work has detailed its role in detection of minute water motion produced by predators and prey organisms, but there is little known about the information sent to the fish's brain concerning bulk water flow. Behavioral data show that many types of fish are very good at reading water current information and can, for example, more efficiently station-keep by finding slower velocity stream water. The intent of the present study was to begin understanding the neural representation of bulk water flow in the fish's midbrain. Our data show that there are neurons sensitive to the direction of water flow and neurons that provide flow velocity information. Our results are consistent with a model in which bulk water flow is encoded by the propagation velocity of turbulences passing along the fish's body.

# INNOVATION SHOWCASE 2009: POSTER PRESENTATIONS

## USING COMPUTATIONAL NEUROSCIENCE TO BUILD BETTER COMPUTERS

*Mazad S. Zaveri, Danny Voils, Dan Hammerstrom*

Recent advances in neuroscience have provided sophisticated computational models of neuro-biological circuits, such as the neocortex. Studying the hardware implementation of these models using current and emerging nano-scale semiconductor technologies opens up exciting new approaches to computer engineering and intelligent computing. The performance/price analysis for such hardware implementations provide the prospects for building cortex-scale neuromorphic systems. These application-specific computers/processors can be used for large-scale real world applications in computer vision, image and speech recognition, robotics, etc.

## CONTEXT AND SOCIAL REQUESTS FOR INFORMATION BY CHILDREN WITH ASD

*Amy L. Donaldson*

Context can influence communication and interaction; for children with autism spectrum disorders (ASD) manipulation of contextual variables may influence social communication behaviors, such as requesting information (RI). The study investigated the influence of activity choice on production of RI within the natural environment.

## OREGON STATE UNIVERSITY

## EFFECTS OF BMAL1 DELETION IN GNRH NEURONS ON THE REPRODUCTIVE CAPACITY OF MICE

*K.J. Tonsfeldt, M. Pejchal, M. Jimenez, M. Acosta, J.S. Takahashi, J.E. Levine, P.E. Chappell*

## THE EFFECTS OF AGING ON PROTEIN EXPRESSION OF NMDA RECEPTOR SUBUNITS IN THE SYNAPTIC MEMBRANE FRACTION AND RELATIONSHIPS TO SPATIAL REFERENCE MEMORY

*K.R. Magnusson, X. Zhao, R. Rosenke, D. Kronemann, A. W. Dunah, D. G. Standaert*

## SYNTHESIS OF 1,1-[1-NAPHTHYLOXY-2-THIOPHENYL]-2-METHYLAMINOMETHYLCYCLOPROPANES AND THEIR EVALUATION AS INHIBITORS OF SEROTONIN, NOREPINEPHRINE, AND DOPAMINE TRANSPORTERS

*Jongtae Yang, Rajan Juniku, James D. White, Kun Huang, and David T. Wong*

Stereodefined trisubstituted cyclopropanes bearing naphthyloxy, thiophenyl, and (N-methylamino)-methyl groups were synthesized in enantiopure form employing asymmetric cyclopropanation of (E)- and (Z)-allylic alcohols as the key step. In vitro assays of the synthesized cyclopropanes revealed that the  $K_i$  of one of the enantiomers as a dual inhibitor of serotonin and norepinephrine transporters is in the low nanomolar range and is comparable to that of duloxetine.

## WIRELESS, MICROPOWERED, NON-CONTACT SENSORS FOR NONINVASIVE EEG MONITORING

*Patrick Y. Chiang, Gert Cauwenberghs, Gabor Temeš, Mike Chi, Joe Crop*

A fully-integrated, single-chip EEG sensor is being developed at OSU and UCSD. A patented capacitive, non-contact electrode eliminates the use of wet contacts and allows sensing through clothes. Innovations in ultra-low power analog/digital converters, wireless transmission, and Moore's law technology scaling enables a low-cost, single-chip, band-aid sized, form factor with a 100x improvement in energy-efficiency over conventional off-the-shelf EEG sensors.

# INNOVATION SHOWCASE 2009: POSTER PRESENTATIONS

## UNIVERSITY OF OREGON

### **A GENETIC MOSAIC CANCER MODEL REVEALED CHIMERIC NATURE OF GLIOMA PROPAGATING CELLS**

Chong Liu and Hui Zong

The Zong lab uses the MADM system (Mosaic Analysis with Double Markers) to create mutations of tumor suppressor genes in a sparse number of neural stem cells to model human gliomas. A powerful characteristic of this system is that each cell that contains the mutations is concurrently labeled with GFP during the recombination process (while its wild-type sister cell is labeled with RFP). We observed profound changes in cell behaviors much earlier than the formation of tumors, and found that the gliomagenesis process appears to be due to a small deviation from the normal brain development pathway rather than a chaotic process.

We are currently pursuing possible intervening methods to treat glioma by restoring the developmental order in tumor cells. In addition to glioma modeling, the MADM system can be easily applied to many other areas of brain research and to pre-clinical modeling of other human neurological diseases.

### **NEURAL PROCESSING OF EMOTIONAL STIMULI IN INFANCY AS A PATHWAY FOR THE IMPACT OF INTERPARENTAL DYNAMICS ON INFANTS' EMOTIONAL DEVELOPMENT**

*Alice Graham, Philip Fisher, Yalchin Abdullaev, Anne Mannering, Christina Gamache Martin, & Consuelo Aranguiz*

The present study seeks to increase understanding of infants' neural processing of emotional tone of voice in order to investigate a plausible pathway for the impact of interparental conflict on infants' emotional development. It is hypothesized that a high level of interparental conflict in combination with carrying the short allele of the serotonin transporter linked polymorphic region (5-HTTLPR) will be associated with infants showing a higher level of amygdala activity during presentation of an angry emotional tone of voice. Higher levels of amygdala activity are conceptualized as a potential indication of emotional reactivity and subsequent dysregulation of the neuroendocrine stress response system.

### **MAGNETIC RESONANCE IMAGING COILS WITH INTEGRATED DIFFERENTIAL PREAMPLIFIERS**

Jolinda Smith and Cliff Dax

We have developed a novel type of magnetic resonance imaging coil with the preamplifier integrated directly into the coil itself. This approach greatly reduces the bulk of the coil, increases coil flexibility, and simplifies construction of multi-element coil arrays. This coil is particularly well suited for parallel imaging, a technique that dramatically reduces imaging time without sacrificing image quality.

### **NETRIN SIGNALING IS REQUIRED FOR DEVELOPMENT OF AN IDENTIFIED ZEBRAFISH MOTONEURON**

*Laura A. Hale and Judith S. Eisen*

We study development of CaP and VaP, two identified zebrafish motoneurons, to gain insight into how neurodevelopment occurs in animals, such as ourselves, with more elaborate nervous systems that are more difficult to study. Our recent work identifies a novel role for Netrin 1a, a common axon guidance molecule found in all vertebrates, in restricting motoneuron axon extension. Our results suggest a potential molecular mechanism for refining cellular identity of motoneurons to ensure that they innervate the appropriate muscle.

# INNOVATION SHOWCASE 2009: POSTER PRESENTATIONS

## **ERBB2/ERBB3 SIGNALING IS REQUIRED FOR DRG NEURON FORMATION**

*Yasuko Honjo and Judith Eisen*

Dorsal root ganglia (DRGs) are clusters of sensory neurons that convey various somatosensory information, such as touch, temperature, and pain to the central nervous system. We found that zebrafish ErbB2 and ErbB3, tyrosine kinase receptors, mutants have a defect in DRG formation and our results suggest that ErbB2/ErbB3 signaling is required for DRG progenitors to recognize their target position during migration. Zebrafish *erbb3* mutants survive and swim normally. We are currently investigating what sensory systems underlie this responsiveness, including the possibility of persistence of Rohon-Beard spinal sensory neurons and the possibility of secondary waves of DRG development.

## **CHANGING BRAINS: A VIDEO PROGRAM FOR PARENTS, EDUCATORS, POLICYMAKERS: ANYONE WHO CARES FOR CHILDREN**

Neville, H.J., Pakulak, E., Bell, T.A., Dow, M., Hale, L., Karns, C., Paulsen, D., Sanders, L., Stevens, C., Wible, B., and Yamada, Y.

Research in our Brain Development Lab, and in many others, has documented the profound effects of experience on virtually every aspect of human brain development. In the course of studying these effects of experience, and in working extensively with people who care for children, we realized that it would be beneficial if results from this research were made available to everyone who cares for children in a format accessible to a wide audience. With this in mind, we produced a DVD, titled *Changing Brains: Effects of Experience on Human Brain Development*, which will be made available online at no cost and distributed in DVD format at low cost to hospitals, early education programs, schools, and other similar organizations in order to provide this information to anyone who cares for children.

## **DEVELOPMENT AND PRELIMINARY COMPARISON OF TWO MODELS OF PRESCHOOL ATTENTION TRAINING**

Stevens, C., Fanning, J., Klein, S., Currin, J. and Neville H.

Over the past several years we have documented the long developmental timecourse of selective attention and the marked degree of plasticity and vulnerability that it displays. Over the past year we have pilot-tested different types of attention training activities with preschool children in the Head Start program and have observed that they appear to be powerful in improving performance on tests of many aspects of cognition including language, pre-literacy skills, attention, memory, visual-spatial cognition, numeracy and non-verbal IQ. In addition, employing the ERP technique, we have observed that specific mechanisms of selective attention appear to be normalized by these activities. These gains are not observed in control groups. Currently we are further developing, testing, analyzing, and documenting the efficacy of these activities in improving cognitive and school performance.

## **TRANSGENIC TARGETING OF RECOMBINANT RABIES VIRUS REVEALS CELL-SPECIFIC MONOSYNAPTIC CONNECTIVITY**

A. P. Weible, L. Schwarcz , I. R. Wickersham, L. Deblander, H. Wu, E. M. Callaway, H. S. Seung , C. Kentros

Understanding how neural circuits work requires a detailed understanding of cellular-level connectivity. Previous studies have established a solid, general understanding of connections in the brain. The techniques employed, however, are limited in that they 1) lack cellular specificity of label uptake, 2) may spread further than a single synapse, and/or 3) result in highly variable intensity of label making it especially difficult to visualize minor inputs. The system described here resolves these issues through genetic targeting of a recombinant rabies virus expressing the fluorophore mCherry. When mated to specific tTA lines, tetO/TVAG mice should prove invaluable in the study of the circuitry of the mammalian CNS by determining the connectivity of specific cell neuronal cell types.

# INNOVATION SHOWCASE 2009: POSTER PRESENTATIONS

## SIGNATURE RESEARCH CENTERS & INDUSTRY PARTICIPANTS

### DEVELOPMENT OF SAFE BIOLOGICAL THERAPEUTICS FOR HEART ATTACK AND ACUTE ISCHEMIC STROKE

Erik Tucker, Sawan Hurst, Michelle Berny, Leslie Bush, Owen McCarty, Enrico Di Cera, András Gruber

#### **Aronora LLC**

Aronora, LLC is developing therapeutic thrombin analogs to provide safe treatment for up to 5 million heart attack and stroke victims annually. Current treatments, such as the “clot-busting” fibrinolytic enzyme Alteplase, are dangerous due to bleeding side effects, and can only be administered within three-hours after disease onset. WE-thrombin, a protein C activator GPIIb antagonist human thrombin analog, will be used beyond that time window while eliminating the side effects of excessive bleeding.

### ONAMI'S 3D SYSTEM FOR TAKING MATERIALS AND DEVICE BREAKTHROUGHS FROM RESEARCH TO MANUFACTURING

Robert D. “Skip” Rung, Janet Teshima, Jay Lindquist and Cindy Dahl

Oregon Nanoscience and Microtechnologies Institute (ONAMI), Oregon's first signature research center, has developed a “3D” – Discover, Develop, Deploy – system to grow nano- and micro-scale technology research and commercialization in Oregon by (1) promoting inter-institutional collaborations among OHSU, OSU, PNNL, PSU and UO to grow research volume and impact; (2) operating a shared-user facility network of outstanding university-based capabilities accessible by all researchers and companies, and (3) managing a VC-advised commercialization gap fund that enables the earliest stage startup companies to take new technology to an investor-ready stage. This close interaction of these three functions and the building of an increasingly capable Oregon R&D network has made ONAMI a frequently-cited national model for connecting research to economic development.

### OREGON TRANSLATIONAL RESEARCH & DRUG DEVELOPMENT INSTITUTE: ADVANCING DRUG DISCOVERY & COMMERCIALIZATION IN OREGON

Jennifer E. Fox, Ph.D.; Yih-Tai Chen, Ph.D.; Martin Smilkstein, M.D.; M. Patricia Beckmann, Ph.D.

The Oregon Translational Research and Drug Development Institute (OTRADI) is a Signature Research Center dedicated to providing a unique link between Oregon university researchers and biotech or pharmaceutical companies with a goal of commercialization of biologically active compounds. OTRADI's research and development program revolves around collaborations with Oregon university researchers and small biotech businesses who provide OTRADI with either proprietary synthetic or natural chemical compounds or novel experimental assays and techniques, which OTRADI uses to advance drug discovery. Through these collaborations, OTRADI has formed the “Oregon Collection”, a proprietary locally-sourced chemical compound library consisting of natural and synthetic compounds, which are of interest to researchers, drug developers, and biopharmaceutical companies worldwide.

### TOOLS FOR NEURO-BASED DISCOVERY: ION INDICATORS AND NEURONAL GENE DELIVERY

Trillium Blackmer, Daniel W. Beacham, Michael O'Grady, Uma Lakshmiathy, Frederick M. Boyce, and George T. Hanson

#### **Life Technologies, Molecular Probes**

Ion indicators can be used in tandem with mammalian-targeted baculovirus (BacMam) delivered targets to allow high-throughput interrogation of historically difficult drug targets such as ion channels. BacMam is tolerated by a wide variety of cells across a broad range of infectivity, allowing titration of expression as well as convenient co-delivery of multiple gene products including genetically encoded biosensors, ion channels, GPCRs or other molecules engineered to measure or control neuronal function.

# THE INNOVATION INCENTIVE

Oregon's public universities are idea incubators. In the past two decades, these dynamic institutions have developed a strong track record of translating those ideas into marketable products and processes. This translation of ideas from lab to market benefits faculty and students, who learn how to turn research and technologies into business opportunities; institutions, which have the potential to receive additional funds to further their research, education and outreach missions; and the Oregon economy, which grows with new products, companies and jobs based on university research.

However, translation of research into commercial application requires support. The risks associated with a new technology's early stages can deter outside investment. The University Venture Development Fund addresses this need, providing a significant state tax credit to donors who support new discoveries from Oregon universities.

## TO LEARN MORE OR PARTICIPATE

More detailed information is available at [www.ous.edu/venturefund](http://www.ous.edu/venturefund)

**Oregon Health & Science University**  
503.228.1730  
[www.ohsufoundation.org](http://www.ohsufoundation.org)

**Portland State University**  
503.725.8798  
[www.pdx.edu/giving](http://www.pdx.edu/giving)

**Oregon State University**  
541.737.4218  
[www.osufoundation.org](http://www.osufoundation.org)

**University of Oregon**  
503.412.0468  
[www.uoventurefund.uoregon.edu](http://www.uoventurefund.uoregon.edu)

For donations to multiple institutions, contact the OUS Chancellor's office at 503.725.5717.

# INNOVATE | COLLABORATE | OREGON

## ABOUT ICOREGON ([WWW.ICOREGON.NET](http://WWW.ICOREGON.NET))

**Innovate | Collaborate | Oregon** is a partnership of Oregon's four premier research universities: Oregon Health & Science University, Oregon State University, Portland State University, and the University of Oregon. The universities have launched a new website to promote interaction between industry and Oregon research universities. The Innovate | Collaborate | Oregon site incorporates a searchable technology portal allowing visitors to identify and learn more about promising discoveries and collaboration opportunities at Oregon's universities.

Oregon universities collaborate with entrepreneurs, companies and the business community to ensure that ideas generated by faculty, students and staff reach the private sector to create products and services which benefit the public. Innovate | Collaborate | Oregon will allow greater industry access to the latest advances in university research and enable the universities to generate resources to continue academic research. It also provides the public with an opportunity to learn more about world-class research in the State of Oregon.

Oregon's public research universities collaborate on initiatives in addition to Innovate Collaborate Oregon. These include the University Venture Development Fund, The Oregon Innovation Showcase and participation in Oregon's Signature Research Centers (ONAMI, BEST, and OTRADI).