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Special Edition

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# Innovation at RUSH

## A message from the Associate Provost for Research

Welcome to this special edition of "Innovation at RUSH". This newsletter is dedicated to the superb research being conducted in the basic science, clinical and community science laboratories throughout RUSH. It emphasizes the accomplishments of the countless innovators/inventors who are committed to studying and finding solutions to conditions that adversely

affect society. I hope you will take pride in our accomplishments. It is because of **you** that RUSH is recognized as a world class institution with world class researchers.

I hope you enjoy reading about our successes.



James L. Mulshine, MD

## Success Stories

### **Ampyra®**

A drug whose clinical benefit in treating multiple sclerosis was discovered at RUMC was approved by the FDA on January 22 and is now available in the U.S. The drug, called dalfampridine, is the first therapy for MS that can be taken orally. It is also the first FDA-approved therapy to treat impaired walking, which affects about 300,000 of the 400,000 MS patients. It is a debilitating symptom of the disease limiting patient's ability to accomplish the most basic tasks of daily living. While

other MS drugs work by decreasing the inflammation that causes damage to the CNS, dalfampridine is designed to allow conduction of nerve impulses despite the damage. Research that led to the discovery of its therapeutic value dates back to the 1960s, when Dr. Floyd Davis, then a neurologist in training and later a physician at Rush, became intrigued by an unusual clinical observation: many MS patients fare better when their body temperature is slightly lowered, even by just two- or three-tenths of a degree. It was important because it showed "that the damaged nerve fibers

were not doomed, as previously believed," said Dr. Dusan Stefoski, director of the Rush Multiple Sclerosis Center, who teamed up with Davis in 1978. Davis learned of dalfampridine, which blocks the potassium ion channels in nerve fibers. In a small proof-of-concept study conducted in 1983, Davis and Stefoski injected the drug in 11 patients. "It was stunning," Stefoski said. "After a single intravenous dose, the patients could walk better and see better." Ampyra® is now being sold as a twice daily oral medication by Acorda Therapeutics of Hawthorne, NY.



## Success Stories Continued-

**OncotypeDX® Breast Cancer Assay** by Melody Cobleigh, MD, comprises a breakthrough in the development of breast cancer treatment selection tests. The assay is comprised of 21- genes and provides a prediction of benefits from chemo. It also provides information that can be used in making decisions in women with early- stage breast cancer. The assay is being sold by Genomic Health, Inc. of Redwood City, CA.

**Joint Load Sparring Footwear** by Najia Shakoor, M.D., Markus Wimmer, PhD and Roy Lidtke, DPM,

The footwear is designed to reduce the hip and knee joint loads in individuals with osteoarthritis or who are at risk for lower limb OA. It is presumed that a long term decrease in joint loads could slow the progression of osteoarthritis. This shoe design mimics features of the bare foot.

**Cognitive Connections Series for Executive Functioning** by Georgia Bozeday, Julie Gidaspow, Adelaide Allen, Barbara Resnick, Bradley Bergey, Sarah Minton, and Mike Smith, , The works consist of a series of copyrighted materials geared towards curriculum development in the area of Executive Functions. The series includes a college level edition available for college students to aid in utilizing EF strategies in their academic and social life.

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*“RUSH received 7 issued US Patents in FY10.”*

## Issued Patents

**7,683,332, Wei Chang**  
“Integrated single photon emission computed tomography (SPECT)/ transmission computed tomography (TCT) system for cardiac imaging”

**7,683,331, Wei Chang**  
“Single photon emission computed tomography (SPECT) system for cardiac imaging”

**7,615,075, Achim Kunze; Marcus Wimmer** “Plastic implant impregnated with a degradation protector”

**7,595,295, Deanna Marchionini; Timothy Collier**

“Use of pleiotrophin to promote neurogeneration”

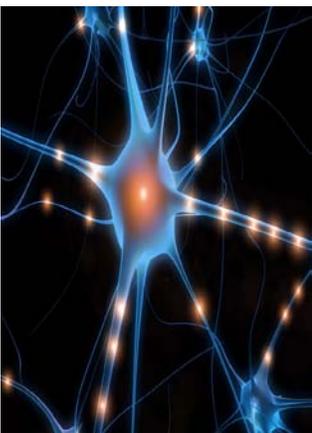
**7,585,848, Koichi Masuda;**  
“Methods and compositions for treating, inhibiting and

reversing disorders of the intervertebral disc”

**7,585,667, Paul Olivo; Peter L.Collins; Mark E. Peeples**

“Negative strand RNA virus replicon”

**7,569,345, Melody Cobleigh et al.** “Gene expression markers for breast cancer prognosis”



## Technology Highlights

**“Synaptic Transponders”,**  
Marvin Rossi, MD, PhD

This innovative technology is designed to release electric energy to treat cancer cells in cancer patients, or control the flux of electric wave to treat cardiac and/or epileptic patients.

**“Procedure for Circadian Phase Assessments at Home”,**  
Helen Burgess, PhD

This novel, at-home approach determines the melatonin rhythm (and thus DLMO) in dim light at home and can be used to assist in managing sleep disorders.

**“Modified Lupus Questionnaire”,**  
Meenakshi Jolly, MD

This Quality of Life Assessment for Lupus patients is a 9 page, 34 question instrument that assesses the degree SLE affects a patient’s quality of life.

## Royalties

Rush University Medical Center received \$818,078.50 in royalty revenue for FY2010(July 1, 2009- June 30, 2010). Rush distributed \$500,159.46 to inventors(\$100,000.00 of which posted from revenues received in FY09).

## Innovator Profiles

**David Bennett, MD** is the Robert C. Borwell Professor of Neurological Sciences Professor; Director, Rush Alzheimer's Disease Center, Governance Task Force.

Known for his research regarding the causes, treatment and prevention of Alzheimer's disease and other common neurologic conditions of aging, Dr. Bennett's primary research interest is understanding the neurobiologic pathways linking genetic and environmental risk factors to loss of cognition, and understanding why many older persons are able to live with severe Alzheimer's disease changes in the brain without suffering from memory loss (cognitive or neural reserve). Dr. Bennett is principal investigator of several studies funded by the National Institute on Aging, including the Rush Alzheimer's Disease Core Center, the Religious Orders Study and the Rush Memory and Aging Project.



**Robert Eisenberg, PhD** is the Francis and Catherine Bard Professor, Professor and Chairman, Molecular Biophysics and Physiology, Graduate College, Rush Medical College

Robert is interested in studying ion channels as physical objects, trying to use the tools of physics, chemistry, engineering, and applied mathematics to understand how they work. Ion channels are proteins with a hole down their middle that are the gatekeepers for cells. Ion channels control an enormous range of biological functions in health and disease but have simple enough structures that they can be analyzed with the usual tools of physical science. Amazingly many complex properties of two very different kinds of channels can be understood by a simple model of spheres in a cylinder. The spheres have electrical charge and represent the special properties of the channel protein. The model has produced biological, chemical, physical, and even mathematical insights in some 35 papers. On the one hand, the model explains how nerve cells tell sodium ions from potassium ions and thus can conduct signals. On the other it tells how heart cells tell calcium ions (spheres) from sodium ions and thus can contract in a coordinated way. The model demands a new kind of mathematics, called energy variational analysis that was developed to explain liquid crystals (in our televisions and computer screens) and had not been used in biology or chemistry before now.



**Tibor Glant, MD PhD** is The Jorge O. Galante, MD, DMSc Chair, Director, Molecular Biology Research Lab and Professor, Biochemistry and Orthopaedics Surgery

Dr. Glant's major interests and research directions are: (i) the study of the immunopathology of extracellular matrix components; (ii) the autoimmune mechanisms of rheumatoid arthritis and in corresponding animal models; (iii) the signaling mechanisms which determine antigen specific Th1/Th17 and Th2 responses in autoimmune diseases including diverse effects of altered peptide ligands of arthritogenic epitopes; (iv) the antigen presentation mechanisms in normal and pathological (autoimmune) conditions; (v) the molecular polymorphism/diversity and disease-associated splicing variants of core proteins of various cartilage matrix molecules; (vi) the functional and pathophysiological aspects of domains of cartilage proteoglycan aggrecan, link protein, including the targeted disruption (knockout) and overexpression of these macrom and olecules; (vii) identification of (autoimmune) arthritis susceptible gene(s); (viii) the potential gene and immunotherapeutic interventions in autoimmune/inflammatory diseases, and (ix) the cellular and molecular (signaling) mechanisms of pathological bone resorption in failed total hip arthroplasties. All of these major directions involve basic molecular biology, biochemistry, cell biology, signal transduction and immunology studies.



**Paula Meier, DNSc, RN, FAAN** is a Professor of Women, Children and Family Nursing and of Pediatrics, and is the Director for Clinical Research and Lactation, Neonatal Intensive Care Unit.



Paula has worked as a practitioner and researcher in the area of human milk, lactation and breastfeeding for premature infants and their mothers since 1975. She joined Rush in 1996, and established the internationally-recognized Rush Mothers' Milk Club program that prioritizes "sharing the science" about human milk and lactation with families of NICU infants. The receipt of a demonstration project grant from the Colonel Stanley McNeil foundation in 2009 allowed Meier to produce a DVD, *In Your Hands* that features Rush NICU families and staff communicating the importance of human milk when infants are born prematurely. This DVD has been made available free of charge to institutions that serve the Chicago community, including the Chicago Department of Health and the WIC program clinics. Meier has conducted numerous externally-funded research and demonstration projects, & currently serves as the principal investigator for a 5-year, \$2.76 million, NIH-funded study, "Health Outcomes and Cost of Human Milk Feedings for Very Low Birthweight Infants." She is also co-investigator on a 3-year, \$2.9 million AHRQ-study, Accelerating Adoption of Comparative Effectiveness Research in Premature Infants. She serves as the President-Elect for the International Society for Research in Human Milk and Lactation.

## Research Affairs Directory

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**The Research and Clinical Trials Administration**  
(RCTA) facilitates the timely execution and completion of high-quality clinical research at Rush

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