The W. M. Keck Center

MISSION

Every 41 minutes another person sustains a spinal cord injury. The mission of the W. M. Keck ce is the development of effective treatments for acute and chronic spinal cord injuries and to mo human lives as rapidly as possible.

A BRIEF HISTORY

A determination to alleviate human suffering led Rutgers, The State University of New Jersey to establish a world-class neuroscience center. The first-step in fulfilling that commitment was the August 1997 recruitment of **Dr. Wise Young** to design and lead a unique program built on a problem-solving approach to neuroscience. Dr. Young is one of the world's outstanding neuroscientists and a leader in the field of spinal cord injury.

In December 1998 a "Wall Breaking Ceremony" marked the beginning of construction funded by a $2.1 million grant from the **W. M. Keck Foundation**. On November 5, 1999 the dedication of a state-of-the-art research facility was attended by over 300 researchers, clinicians, politicians, supporters, and hope-filled families.

Since the opening of the Center, three stellar senior faculty have joined Dr. Young in conducting cutting edge collaborative research. **Dr. Martin Grumet**, an expert in spinal cord and brain injury repair and **Dr. Ronald P. Hart**, a leader in microarray technologies in central nervous system trauma, became part of the Center in 1999 and 2000 respectively. In 2004 **Dr. Melitta Schachner**, a world-renown pioneer in molecular and cellular neurobiology, was named the first New Jersey Professor of Spinal Cord Research and joined the Center faculty.

Dr. Grumet was named Center Director in 2002 with Dr. Young becoming Founding Director.

FACILITIES

Funded by a grant from the **W. M. Keck Foundation**, the W. M. Keck Center is designed for team science and interactive communication. The 10,000 square foot facility includes a large central laboratory with specialty areas dedicated to molecular, cellular, and tissue analyses, a state-of-the-art confocal facility, tissue culture laboratory, four-station animal surgery suite with

separate animal holding area, four specialized laboratory spaces, offices, conference spaces, seminar room, machine shop, and staff lounge. The Center is designed to be open, interactive, and handicap accessible.

The center is fully equipped to carry out high-volume studies of spinal cord injury models. Its multi-user design facilities allow teams of surgeons and researchers to significantly boost productivity and capability in-house, with consortia of scientists, and with collaborating laboratories.

Within the Center is a broad range of modern equipment including a Ventana Discovery System automated ISH/microarray/IHC workstation, Perkin-Elmer MultiProbe II liquid handling system, Applied Biosystems 7900HT real-time PCR, 96-well Bio-Tek MicroScan UV/VIS spectrophotometer, Hacker cryostat, two Hewlett-Packard Atomic Absorption Spectrometers, Speed-Vac system, a Palm/Zeiss laser capture system, Nikon Axiophot microscope, Zeiss LSM510-META confocal microscope system, Zeiss 200M Deconvolution microscope with cell culture incubator chamber, Zeiss Stemi SV11 microscope, graphics workstation running BitPlane deconvolution and 3-D reconstruction software, several fluorescence microscopes, four Hera cell incubators, and all required standard laboratory equipment such as centrifuges, water baths, etc. Computer equipment includes several G4 Macintosh and a Monster PC workstation HPxw8000 (dual Xeon processors, 3>06 GHz) configured for simultaneous Windows XP and Linux operating system use via VMware's virtual machine software used for deconvolution and 3-D image reconstruction of confocal images. Computer equipment includes several G4 Macintosh and a Monster PC workstation HPxw8000 (dual Xeon processors, 3>06 GHz) configured for simultaneous Windows XP and Linux operating system use via VMware's virtual machine software used for deconvolution and 3-D image reconstruction of confocal images.

Designed by architects **Larry Wente and Sterling Plenart**, the W. M. Keck Center for Collaborative Neuroscience adheres to three principles: the Center accommodates the multiple technologies needed for multidisciplinary studies; the design fosters collaboration; and, the facility is not only accessible but usable by people in wheelchairs. The design flowed from these principles.

Eighty percent of the space is shared with all working spaces shaped to facilitate people collaboration. All working surfaces are desktop for sit-down users. Under-the-counter refrigerators with double glass doors are accessible and located in the appropriate working areas. To meet storage needs, each user is assigned one or more mobile rolling cabinets. To make the laboratory comfortable and home-like, the Center includes a comfortable wood-paneled staff lounge with refrigerator, microwave, and dishwasher. Because people in wheelchairs cannot reach up high, there are no wall cabinets thus permitting the display of original art including several works created by people with spinal cord injuries. The oval motif, use of wood and glass, choice of colors, and indirect lighting create an atmosphere that is warm and welcoming for staff and visitors but with a modern, high-tech look that befits the standard of research being conducted.

Adjacent to the Keck Center is the new **Rutgers Stem Cell Research Center (SCRC)**. In collaboration with scientists from throughout New Jersey, the Keck Center operates the SCRC to allow work with both NIH-approved and non-approved human embryonic stem cell lines.

Faculty and Staff

Faculty and Senior Administration

Martin Grumet, Ph.D.,
Director and Professor I

Dr. Martin Grumet, director of the W.M. Keck Center for Collaborative Neuroscience and a professor at Rutgers, The State University of New Jersey, is acknowledged to be one of the leading researchers in brain development and spinal cord injury repair. Dr. Grumet obtained a bachelor of science degree in Physics from the Cooper Union and a doctorate in Biophysics from The Johns Hopkins University. He was a postdoctoral fellow at the Rockefeller University with Nobel Laureate Dr. Gerald M. Edelman where he was appointed Assistant Professor in 1984.

In 1990, Dr. Grumet moved to New York University Medical School as Associate Professor of Pharmacology. In 1999, he was appointed Professor of **Cell Biology and Neuroscience** at Rutgers University and joined the W.M. Keck Center as its Associate Director. In 2002, he became Director of the W.M. Keck Center of Collaborative Neuroscience. Dr. Grumet has purified and cloned several novel proteins. As a graduate student he identified and purified the first cytochalasin-like protein now called capping protein that regulates microfilaments of the cytoskeleton. He then turned his attention to the study of cell surface receptors that mediate cell-cell interactions in the nervous system. He designed novel cell adhesion assays and isolated the first heterophilic cell adhesion molecule (CAM) that mediates interactions between neurons and glia, first called Ng-CAM, now known as L1. In cloning the gene for this protein, he discovered a related CAM in the L1 family called Nr-CAM. These proteins play critical roles in nerve development and brain function and have been implicated in human diseases such as X-linked hydrocephalus.

Dr. Grumet's work has applied expertise in cell adhesion to problems in brain tumor biology and, more recently, in spinal cord injury research. He isolated the first cell line with radial-like properties and has demonstrated the feasibility of implanting such cells into the central nervous system to improve recovery following injury. These results provided the catalyst for his recruitment to the W.M. Keck Center for Collaborative Neuroscience to focus his research on repairing the injured spinal cord.

Dr. Grumet has served on advisory committees for grant reviews at the NIH and NSF, and has served on the editorial boards of Perspectives in Developmental Neurobiology, and Cell & Tissue Research.

Ronald P. Hart, Ph.D.,
Associate Director and Professor I

Dr. Ronald P. Hart, associate director and member of the W.M. Keck Center for Collaborative Neuroscience and a professor at Rutgers, The State University of New Jersey, is recognized as a leading expert in microarray technologies in models of trauma to the central nervous system. Dr. Hart obtained a bachelor of science degree from The University of Connecticut and a doctorate from the University of Michigan Medical School. Following postdoctoral training at Rockefeller University, he joined the Rutgers (Newark) faculty in 1985.

In 2000, Dr. Hart was recruited to establish functional genomics technologies at the W. M. Keck Center for Collaborative Neuroscience where he also became a professor in the **Department of Cell Biology and Neuroscience**. Beginning with a pilot project funded by the Christopher Reeve Paralysis Foundation, Dr. Hart established the **Neuroscience Gene Expression Laboratory (NGEL)** within the W. M. Keck Center. Dr. Hart has trained over 75 national and international scientists in the use of microarrays and actively works in partnership with dozens of researchers throughout the world.

Dr. Hart's specialty is molecular biology and the expression and processing of mRNA in cells. In 1987, with support from a National Institute of Mental Health Research Career Development Award, he expanded his training first into neuroscience and then neuroimmunology. Dr. Hart was one of the first to identify specific mechanisms linking inflammation in the nervous system to the activation of growth and differentiation factors. His laboratory cloned many of the first inflammatory cytokines from the rat nervous system and has made these available to researchers worldwide.

In 2001, Dr. Hart's group published the first comprehensive gene expression analysis of acute spinal cord injury. In 2005, Dr. Hart was awarded one of the first **New Jersey Stem Cell Research Grants**. He serves on the board of scientific advisors for the SCIGenes database at the University of Kentucky and is the author of over 50 publications.

Melitta Schachner, Ph.D., Research Professor II
New Jersey Professor of Spinal Cord Research

Dr. Melitta Schachner, New Jersey Professor of Spinal Cord Research and a research professor at Rutgers, the State University of New Jersey, is a world-renowned pioneer in molecular and cellular neurobiology. Dr. Schachner received her bachelor and masters degrees from the University of Tuebingen and a doctorate in molecular biology from the Max Planck Institute for Biochemistry, Munich, Germany. She was awarded a post-doctoral fellowship at Harvard Medical School, Boston, Massachusetts. During this period she was invited to become part of a leading research team at Sloan Kettering Institute in New York. She was an instructor and assistant professor at Harvard Medical School and then became the first chair of neurobiology in Germany at the University of Heidelberg. She established a new department of neurobiology at the Swiss Federal Institute of Technology, Zurich, Switzerland, and became its first chair. She then became chair of the Institute for Biosynthesis of Neural Structures at the Centre of Molecular Neurobiology at the University of Hamburg, Germany. In 2004, Dr. Schachner became the first recipient of a named chair awarded by the New Jersey Commission on Spinal Cord Research.

Dr. Schachner discovered several seminal adhesion molecules important in the development of the nervous system, such as L1, CHL1 and the tenascins. She was among the first to recognize the importance of the functions of carbohydrates in cell recognition, being able to fine tune cell interactions in the nervous system. One of many outstanding achievements was the discovery of signal transduction mechanisms mediated by recognition molecules at the cell surface. Another important achievement was the finding that recognition molecules are important not only for nervous system development, but also are instrumental in regeneration after nervous system lesions and in shaping the activity of synapses. She was first to generate a knockout mutant for a neural recognition molecule, the P0 immunoglobulin-superfamily member involved in myelination in the peripheral nervous system. This study was seminal for the investigation of nervous system diseases.

A prolific researcher and writer, Dr. Schachner has published more than 700 articles in highly regarded journals. She has served on many academic and research boards. She is regarded internationally as one of the most successful women in neuroscience and is among the hundred most cited neuroscientists in the world.

Dongming Sun, M.D., Ph.D. Assistant Research Professor
Assistant Director, Assistant Research Professor

Dr. Dongming Sun, Assistant Director, W. M. Keck Center for Collaborative Neuroscience and an assistant research professor at Rutgers, The State University of New Jersey is a young investigator in the field of spinal cord injury research. Dr. Sun graduated from Beijing Medical University, obtained a doctorate from Columbia University in 1996, and joined the W. M. Keck Center for Collaborative Neuroscience in 2000.

Dr. Sun has worked for ten years on cytoskeleton proteins both as graduate student and as a postdoctoral fellow at Columbia University. He was involved in the characterization of neurofilament triplet proteins assembly, phosphorylation, and axonal movement. Dr. Sun also is involved in the identification of microtubule actin cross-linking factor (MACF), a new family of cytoskeleton crosslink proteins.

In 2000, Dr. Sun was recruited to W. M. Keck Center for Collaborative Neuroscience to develop therapies for spinal cord injury and to oversee laboratory operations. In his first year at the Center, he received a grant from **New Jersey Commission on Spinal Cord Research** to investigate activated macrophage transplantation as a potential therapy for spinal cord injury. He also is collaborating with other research institutions and with the private sector to develop and test new therapies for the treatment of spinal cord injuries. Dr. Sun currently is directing research to standardize and validate contusion and ischemia spinal cord injury models in mouse and in the development of human umbilical cord blood stem cell treatments for spinal cord injury.

Wise Young, Ph.D., M.D., Founding Director, Professor II
The Richard H. Shindell Chair in Neuroscience

A tribute to Dr. Young by **ProfessirX**

Dr. Wise Young, founding director of the W.M. Keck Center for Collaborative Neuroscience and a professor at Rutgers, The State University of New Jersey, is recognized as one of the world's outstanding neuroscientists. He obtained a bachelor of arts degree from Reed College, a doctorate from the University of Iowa and a medical degree from Stanford University. After a surgery internship at New York University and Bellevue Medical Center, he joined the neurosurgery department at NYU. In 1984, he became director of neurosurgery research. In 1997, as part of Rutgers' commitment to the future, Dr. Young was recruited to establish and direct a world-class center for collaborative neuroscience.

Dr. Young was part of the team that discovered and established high-dose methylprednisolone (MP) as the first effective therapy for spinal cord injuries. This 1990 work upended concepts that spinal cord injuries were permanent, refocused research, and opened

new vistas of hope. This team also played a major role in Andy Blight's signal work on 4-aminopyridine (4-AP), which shows significant promise for increasing nerve conductivity.

Dr. Young developed the first standardized rat spinal cord injury model used worldwide for testing therapies, formed the first consortium funded by the National Institutes of Health (NIH) to test promising therapies, and helped establish several widely accepted clinical outcome measures in spinal cord injury research.

Dr. Young founded and served as editor-in-chief of the Journal of Neurotrauma. He organized the National and International Neurotrauma Societies as forums for scientists to share discoveries and collaborate on spinal cord injury and brain research. He serves or has served on advisory committees for the NIH, the National Academy of Sciences, and NICHD, and has served on advisory boards for many spinal cord injury organizations.

Well-known as a leader in spinal cord injury research, Dr. Young has appeared on "20/20" with Barbara Walters and Christopher Reeve, "48 Hours," "Today," "Eye-to-Eye," Fox News and CNN's news magazine with Jeff Greenfield. His work has been featured in a Life magazine special edition, USA Today, and innumerable other news, talk and print presentations throughout the world. His honors include: NIH Jacob Javits Neuroscience Award (1985-1992), Wakeman Award (1991), Tall Texan of the Year Award (1997), 'Cure' Award (1998), Trustees Award for Excellence in Research (2001), Asian American Achievement Award (2002), Douglass Medal for work with the advancement of young women in the sciences (2003), and Elizabeth M. Boggs Award for service to the disability community (2004). In August 2001, TIME Magazine named Dr. Young as 'America's Best' in the field of spinal cord injury research. In 2005 he was the first researcher elected to the Spinal Cord Injury Hall of Fame. Dr. Young was appointed to the **Richard H. Schindell Chair in Neuroscience** in 2006 by the Rutgers University Board of Governors.

Senior Staff

Yi Ren, Ph.D.

Dr Yi Ren is an associate research professor in the W. M. Keck Center for Collaborative Neuroscience. Dr Ren received her Ph.D from Imperial College of London, UK and postdoctoral research at Nottingham University and Edinburgh University, UK. Dr Yi Ren's area of expertise is cell biology, immunology and oncology. Her primary field is apoptosis in resolution of inflammation. In particular, she was the first to discover that transfer of a gene, the scavenger receptor CD36, was able to confer increased capacity for clearance of apoptotic cells. The long term significance of her work is to understand that clearance of dying cells not only plays an important role in promoting resolution of inflammatory responses but is also intimately involved in infection and cancer. In addition, she has extensive research experience on the role of macrophage migration inhibitory factor (MIF) in inflammatory diseases and tumor development.

Crista L. Adamson, Ph.D.

Dr. Crista L. Adamson is a research associate in the W.M. Keck Center for Collaborative Neuroscience at Rutgers, The State University of New Jersey. Dr. Adamson obtained a bachelor of arts degree and masters degree in biology from the University of Southern California and a doctorate in Physiology and Neurobiology from Rutgers, The State University of New Jersey. Her graduate research focused on spiral ganglion neuronal signaling, using immunocytochemistry to augment data from patch clamp recordings to characterize neural encoding and evaluated the effects of neurotrophins on the distribution of voltage-gated ion channels. She currently conducts research on therapeutic strategies for treatment, regeneration, and recovery of spinal cord injury. Her current

projects include vaccination therapies in rat spinal cord injury and the study of the neuroprotective effects of the drug erythropoietin following spinal cord injury as well as localization of its cognate receptor and its mechanism of action in stem cells.

Noriko Kane-Goldsmith, Ph.D.

Dr. Noriko Kane-Goldsmith is an assistant research professor at the W.M. Keck Center for Collaborative Neuroscience at Rutgers, the State University of New Jersey. Dr. Kane-Goldsmith obtained a Bachelor of Arts from Kyoto College of Education, Kyoto, Japan, Master of Science in Biology from Nara National Women's University, Nara, Japan, and Ph.D. in immunology from Wakayama Medical College, Wakayama, Japan. Her postdoctoral research was done at the Waksman Institute of Microbiology, Rutgers the State University of New Jersey and in the Division of Endocrinology at Mount Sinai School of Medicine, New York. She conducted numerous research projects including immunohistological studies on the expression of MHC class II antigens (HLA-DP, DQ, and DR) in autoimmune thyroid disease, neuronal cell survival /apoptosis in response to DNA-damaging agents, and immunocytochemistry in neurons utilizing laser scanning confocal microscopy. In addition to research on the cell adhesion molecule neurofascin, Dr. Kane-Goldsmith manages the Imaging Facility in the W.M. Keck Center consulting with more than fifty research scientists and graduate students from UMDNJ and Rutgers. Her expertise includes confocal microscopy, quantitative image analysi, and three-dimensional reconstruction from histologically stained 2-D images of the injured rat spinal cord.

Hedong Li, M.S., Ph.D.

Dr. Hedong Li is a research associate in the W.M. Keck Center for Collaborative Neuroscience at Rutgers, The State University of New Jersey. Dr. Li obtained a Bachelor of Arts and a Master's Degree in Biology from Nankai University, Tianjin, China and a doctorate in Molecular Neuroscience from Wayne State University, Detroit, Michigan. For his Ph.D., Dr. Li studied the mechanism of the families of adhesion molecules during development and cloned chicken neuron, a chondroitin sulfate proteoglycan that modulates N-cadherin function in developing chicken retina. Dr. Li has identified the N-terminal domain of neurocan molecule that serves as functional epitope. At the Keck Center, Dr. Li developed an interest in radial glial cells, a cell type that gives rise to both neurons and glia during CNS development. Dr. Li has been characterizing radial glial cells during development as well as after transplantation into the injured spinal cord. Dr. Li has generated multiple radial glial cell lines that have been studied extensively in spinal cord transplantation. These radial glial cells have been shown to have both neuro-protective and regenerative effects in the rat contusion model. Dr. Li also is working on to embryonic stem (ES) cells in the hope of using ES cells as a source of radial glia for therapeutic purposes.

Bor Tom Ng, M.D.

Dr. Bor Tom Ng is supervisor of neurochemistry supervisor at W. M. Keck Center for Collaborative Neuroscience at Rutgers, The state University of New Jersey. Dr. Ng received her M.D. from Beijing Medical College, Beijing, China. She joined Dr. Wise Young's research team at New York University and has been working with Dr. Young for more than twenty years. Dr. Ng is very knowledgeable in every aspect of spinal cord injury research. Her current responsibilities include: atomic absorption measurement, tissue dissection and preparation for histological and molecular biological studies, tissue section and staining for histological and immunochemical analysis, and surgery and drug preparation. Dr. Ng trains many researchers in these techniques and is a member of the faculty of the international workshops in spinal cord injury research methods.

Hock Ng

Mr. Hock Ng is the manager of the Animal Facility at the W. M. Keck Center for Collaborative Neuroscience at Rutgers, The State University of New Jersey. Mr. Ng joined the research team of Dr. Wise Young at New York University and moved with Dr Young to

Rutgers in 1997. He has been working with Dr. Young for more than seventeen years. While at New York University, Mr. Ng helped establish the standard post-operative animal care protocols following rat spinal cord injury. He has been involved in standardizing surgery, anesthesia, euthanasia, and perfusion procedures. Mr. Ng is part of the mouse spinal cord model and MASCIS Impactor redesign projects. His current responsibilities include supervising and training members of the animal care team, assisting in surgery and animal perfusion, and managing the surgery facility.

Staff

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