



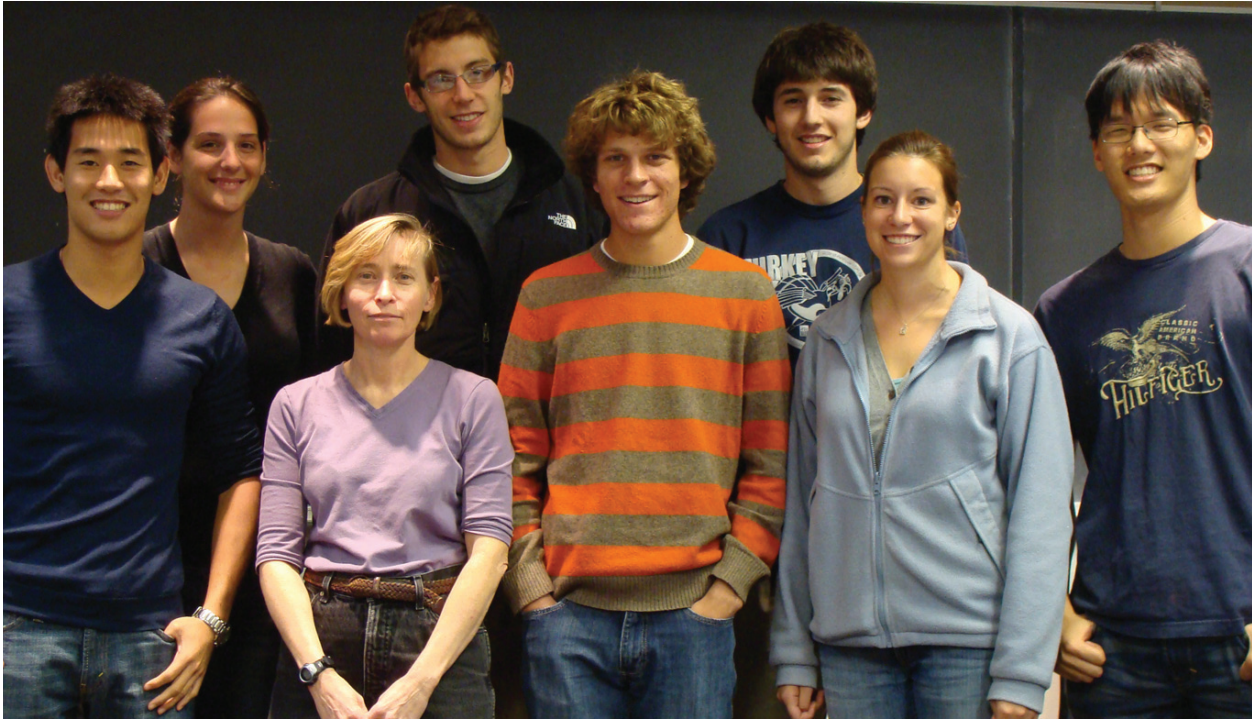
Stem cell outreach at Science Expeditions. Photo by Jeff Miller.

THE UNIVERSITY OF WISCONSIN-MADISON STEM CELL and Regenerative Medicine Center (SCRMC) measures its success in accomplishments:

- Growing astrocytes – the most common cells in the human nervous system – from stem cells to study the large role they play in disorders of the central nervous system.
- Deriving heart cells from stem cells to study certain genetic mechanisms of heart diseases.
- Reprogramming leukemia blood cells to return them to a pluripotent state, providing a new model for studying cancer cells.

Encompassing close to 80 faculty and scientists from more than 40 departments, the center is dedicated to moving discoveries from the laboratory into patient treatment. This year, center scientists organized five new scientific focus groups to stimulate new collaborations and discoveries. SCRMC investigators expanded access for scientists to more types of stem cell and regenerative medicine research approaches. Stem cell research and outreach activities on campus expanded into the new Wisconsin Institutes for Discovery.

International recognition and philanthropy helped center researchers make even more inroads into further developing this still relatively new frontier of science and medicine.



Student Society for Stem Cell Research board members, 2010/2011. Back row, left to right: Meghan Rosenkranz (Outreach Chair), Daniel Walden (Secretary), George Bonadurer (Events Chair), Matthew Tso (Vice President). Front row, left to right: Eric Chen (CALS Student Council Representative), Jayne Squirrell (faculty advisor), Ross Pedersen (Treasurer), Melissa Breunig (President). Image courtesy SSSCR.

AUG10

Students organize stem cell research opportunities

As it began its fifth year, the University of Wisconsin-Madison Student Society for Stem Cell Research explored new ways to involve undergraduates in campus research. Members compiled a list of resources, with the goal of providing workshops, personal assistance and mentoring to those members interested in becoming part of a lab. Society faculty advisor Jayne Squirrell, Ph.D., assistant scientist in the Laboratory for Optical and Computational Instrumentation (LOCI), Department of Molecular Biology, gave the inaugural presentation, a primer for students

who want to learn more about stem cell biology. To expand community awareness of stem cells, members participate in science nights at area schools and in UW-Madison Science Expeditions. They demonstrate basic stem cell culture techniques and answer questions from students.

SEPT10

Weekly meetings provide stem cell insights

Weekly campus Stem Cell Laboratory Meetings for the 2010-2011 academic year moved to the new Wisconsin Institutes for Discovery, making it easy for UW-Madison’s diverse stem cell community to convene and communicate. Organized by Rupa Shevde, Ph.D., director of education and outreach, Morgridge Institute for Research, and Sue Gilbert, SCRMC office operations associate, each meeting attracted up to 100 students, post-doctoral fellows, staff and faculty. Campus researchers shared their latest stem cell-related research and addressed research ethics and public policy.

OCT10

WiCell expands services

WiCell Research Institute, a non-profit affiliate of the Wisconsin Alumni Research Foundation (WARF), in partnership with the SCRMC, expanded critical core services to UW-Madison stem cell scientists in October. WiCell added teratoma services, to predict the stem cells’ abilities to become all other cell types, and testing for mycoplasma, a common cell culture contaminant. To keep pace with the changing needs of the campus research community, WiCell also provides qualified critical reagents, stem cells, discounted cytogenetic services and dedicated research space for new investigators and continuing projects.

NOV10

New system reliably grows safer stem cells

Reporting in the November 1 edition of Nature Methods, Laura Kiessling, Ph.D., professor of chemistry, reported an inexpensive system that takes much of the guesswork out of growing human embryonic stem cells in the lab. Her team’s fully defined culture system for the all-purpose cells promises a more uniform and, for cells destined for therapy, a safer product.



Professor Laura L. Kiessling (left) talks with graduate student Katie Alfare, who is conducting her work in Kiessling’s research lab in the Chemistry Building at the University of Wisconsin-Madison
Photo by Jeff Miller.



Joyce Teng visits with a patient at her UW Health clinic at 1 South Park Street. Teng, who is Madison’s only board-certified pediatric dermatologist, recently won an SCRMC/ICTR pilot grant for translational research using patient-specific induced stem cells to model skin diseases. Image by J. Lenon.

Grants fund clinical translation of regenerative medicine

The SCRMC partnered with the Institute for Clinical and Translational Research (ICTR) and the Coalition for Brain Injury Research on its pilot grants programs to support five stem cell/regenerative medicine projects in 2011.

- Joyce Teng, M.D., Ph.D., assistant professor of dermatology, will model genetic skin diseases using patient-specific iPS cells.
- Qiang Chang, Ph.D., assistant professor of genetics, will study neurodegenerative diseases using induced neurons.
- Masatoshi Suzuki, Ph.D., assistant professor of comparative biosciences in the School of Veterinary Medicine, will research in vivo tracking of human neural progenitor cells in ALS.

- Wan Ju Li, Ph.D., assistant professor of orthopedics and rehabilitation, will study induced pluripotent stem cells differentiated in engineered matrix with a bio-inspired surface for tendon regeneration.
- Ron Kalil, Ph.D., professor of ophthalmology and visual sciences, will address transplantation of human neural progenitor cells to the injured adult rat brain.

The awards support basic research, clinical trials and translational research, through which a basic laboratory discovery may lead to the prevention, diagnosis or treatment of a specific disease. The funding also supports a wide spectrum of patient-oriented research that embraces innovations in technology and biomedical devices. The program targets new investigators or those taking a new direction in their research.



Left to right, Wisconsin Institute for Discovery (WID) lead faculty investigators John Denu, Patricia Brennan, Michael Ferris, John Yin and Tom Turng are acknowledged during a WID grand opening ceremony on Dec. 2, 2010. Photo by Jeff Miller.

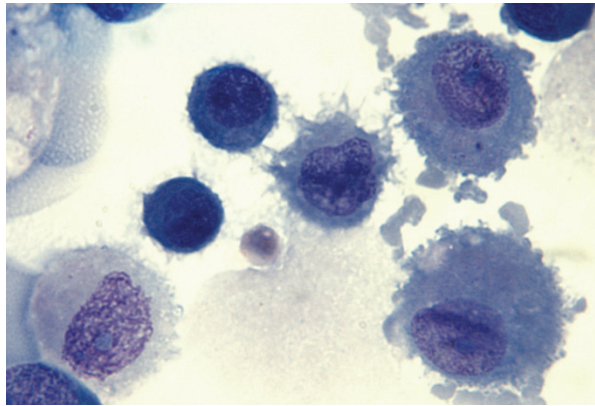
DEC10

Stem cell scientists move into Wisconsin Institutes for Discovery

Thousands flocked to the Wisconsin Institutes for Discovery (WID) for its December grand opening events and tours. Several SCRMC scientists are based in the new research building, including James Thomson, V.M.D., Ph.D., director of Regenerative Biology at the Morgridge Institute for Research, and Lih-Sheng “Tom” Turng, Ph.D., professor of mechanical engineering, who leads the BIONATES (BioNanocomposite Scaffolds for Tissue Engineering) theme at WID. The program

includes associate professor of biomedical engineering Shaoqin (Sarah) Gong, Ph.D., associate professor of biomedical engineering. New to the program is Randolph Ashton, Ph.D., assistant professor of biomedical engineering.

Morgridge Outreach Experiences (MOE) instructors also led public stem cell workshops during the grand opening, and SCRMC staff helped welcome participants and teach them about the promise and power of stem cells and tissue engineering. MOE and SCRMC teachers continue to schedule stem cell workshops for school groups and the public.



Human bone marrow cells were coaxed to become pluripotent, all-purpose stem cells (above) in a new study by a team led by University of Wisconsin-Madison stem cell researcher Igor Slukvin, a professor of pathology and laboratory medicine in the UW School of Medicine and Public Health. Slukvin's group turned banked healthy and diseased human bone marrow into blank-slate stem cells, which have potential use in therapy and could become a powerful laboratory model, as the new induced cells made from diseased marrow carry the same genetic mutations that cause the blood cancer chronic myeloid leukemia.

JAN 11

Thomson wins international award

On Jan. 21, James Thomson, V.M.D., Ph.D., was named winner of the prestigious King Faisal International Prize in Medicine awarded by the king of Saudi Arabia. Thomson is among 57 scientists who have been selected for the Faisal Prize in Medicine during the past 33 years. Among all Faisal Prize winners, nine later were honored with Nobel Prizes for work first recognized by the award.

Thomson, director of regenerative biology at the Morgridge Institute for Research and a University of Wisconsin-Madison scientist since 1994, often is considered the founder of human stem cell science due to his groundbreaking discoveries of nonhuman primate and human embryonic stem cells, made in 1995 and 1998.

FEB 11

Bone marrow from leukemia patients reprogrammed to iPS cells

In the first successful reprogramming of blood cells obtained from a patient with leukemia, Igor Slukvin, Ph.D., associate professor of pathology and laboratory medicine and scientist at the Wisconsin National Primate Research Center, coaxed healthy and diseased human bone marrow to become induced pluripotent stem cells. Announced February 4, this accomplishment lays the groundwork for observing the onset of the blood cancer leukemia in a laboratory dish. Understanding the cancer process at this basic level is key to the development of new treatments and possible cures.

SPECIAL GIFT MAKES A DIFFERENCE

Sister's Alzheimer's inspires unexpected gift

Martha Pavcek taught grade school in the Milwaukee area for much of her life. An alumna of the University of Wisconsin-Madison, she earned a bachelor's degree in education in 1936 and a master's in botany in 1940 and made one gift of \$50 to the University during her lifetime.

After her death in 2009 at age 94, Pavcek's estate gifted more than \$2.7 million to the UW Foundation. In her will, she designated that the total be divided evenly between support for stem cell research and veterinary medical students. The result is the Martha E. Pavcek Stem Cell Research Fund and the Martha E. Pavcek Scholarship Fund.

Pavcek's sister, also a UW-Madison alumna, had previously died of complications from Alzheimer's disease.



Martha Pavcek in 1961

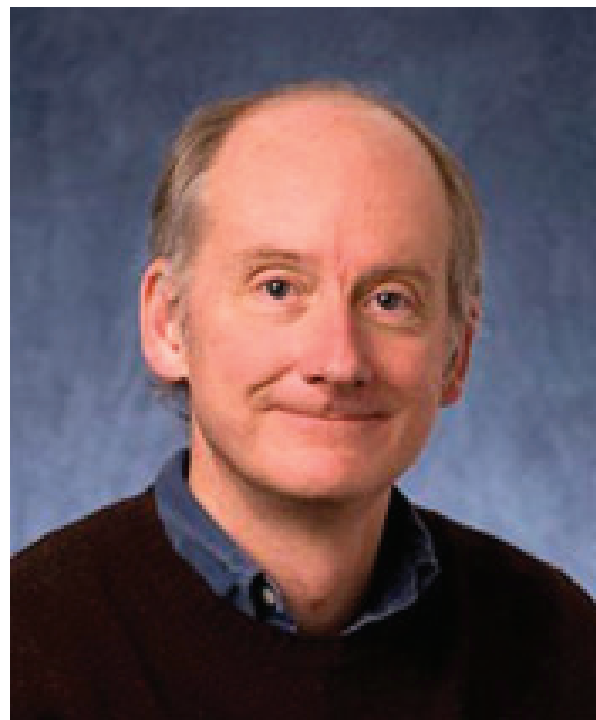
According to the *Milwaukee Journal Sentinel*, Pavcek wanted to spare future generations that fate. Her brother, who died at 52, was a scientist.

SCRMC awards fellowships

The Stem Cell and Regenerative Medicine Center awarded two training fellowships in February.

- Andrew Handorf, research assistant in the laboratory of Wan-Ju Li, Ph.D., assistant professor of orthopedics and rehabilitation, won the graduate fellowship.
- Sanal Kumar, research associate in the laboratory of Emery Bresnick, Ph.D., professor of cell and regenerative biology, won the post-doctoral fellowship.

The SCRMC Fellowship Program is an interdisciplinary pre- and post-doctoral program that supports training UW-Madison graduate students and post-doctoral fellows in interdisciplinary stem cell and regenerative medicine research.



James Thomson, V.M.D., Ph.D., director of Regenerative Biology, Morgridge Institute for Research (MIR) Image courtesy MIR.

MAR 11

Thomson honored for paving way to treat debilitating diseases

James Thomson, V.M.D., Ph.D., was named one of three recipients of the 11th annual Albany Medical Center Prize in Medicine and Biomedical Research. The \$500,000 prize is the largest award in medicine and science in the United States.

Citing diabetes, Parkinson's, cancer and spinal cord injury as examples, the Albany Medical Center's announcement stated that "Collectively, the work of Drs. [Elaine] Fuchs, Thomson and [Shinya] Yamanaka has paved the way toward realizing the vast potential of stem cells to treat or reverse diseases and conditions, as well as to help society better understand how human tissues develop and function."

The prize was established in 2000 by the late Morris "Marty" Silverman to honor scientists whose work has "demonstrated significant outcomes that offer medical value of national or international importance."

UW work critical to clinical trial using gene therapy for neurologic disorders

In its March 17 issue, the journal *Lancet Neurology* (LeWitt et al) published the report of the first successful randomized, double-blind phase II clinical trial of a gene therapy for Parkinson's or any neurologic disorder. The article cited as groundwork for this trial a 2006 rhesus monkey study led by SCRMC faculty member Marina Emborg, M.D., Ph.D., who directs the Preclinical Parkinson's Research Program at the Wisconsin National Primate Research Center. Emborg conducted her research with collaborators from UW-Madison and other institutions. She is a senior scientist at the WNPRC and an assistant professor of medical physics.

APR 11

More similarities identified between embryonic, iPS cells

Induced pluripotent (iPS) stem cells acquire similar chromosome abnormalities at a rate similar to embryonic stem cells, according to findings published in the April 8 issue of *Nature Biotechnology* by Karen Dyer Montgomery, Ph.D., who works in Cytogenetics Services at WiCell and in pathology at UW-Madison. The paper provided another example of how the two types of cells are alike.

Like embryonic stem cells, iPS cells can potentially become any of the 220 mature cell types in the human body. However, scientists are still working to understand subtle differences between human embryonic and induced pluripotent stem cells.

National scientists discuss cellular reprogramming

The sixth annual Wisconsin Stem Cell Symposium, "Reprogramming and Controlling Stem Cell Phenotype," convened April 27 at Madison's BioPharmaceutical Technology Center Institute. Talks on cellular reprogramming focused on manipulating gene expression to control stem cell differentiation. Featured international presenters included UW-Madison scientists Laura Kiessling and James Thomson.

iPS cells advance for eye disease

Patient-specific induced pluripotent stem (iPS) cells offer a unique approach to gene therapy. A broad team of UW-Madison stem cell scientists, collaborating with University of California researchers, reported in *PNAS* in April the genetic correction and analysis of iPS cells from a patient with gyrate atrophy, an inherited disorder characterized by progressive vision loss. They assessed whether mutations acquired during gene correction of iPS cells would cause problems if the cells were used to treat genetic causes of retinal degenerative disease. They isolated iPS cells from a patient with gyrate atrophy and used homologous recombination to correct the genetic defect. After analysis, they noted that the gene repair process doesn't appear to introduce additional deleterious mutations to the iPS cells. A subsequent report in *Stem Cells* by the UW-Madison stem cell team in July showed that retinal cells derived from the patient's gene-corrected iPS cells possessed normal function.

MAY 11

Work produces common brain cells

Writing May 22 in *Nature Biotechnology*, a group led by University of Wisconsin-Madison stem cell researcher Su-Chun Zang,

M.D., Ph.D., professor of neuroscience, reported the differentiation of embryonic and induced pluripotent stem cells into large numbers of astrocytes.

Long considered to be little more than putty in the brain and spinal cord, this common, star-shaped cell has found new respect among neuroscientists. They have begun to recognize its many functions, including its role in a range of central nervous system disorders from headaches to dementia. The ability to culture astrocytes gives researchers a powerful new tool to devise new therapies and drugs for neurological disorders.

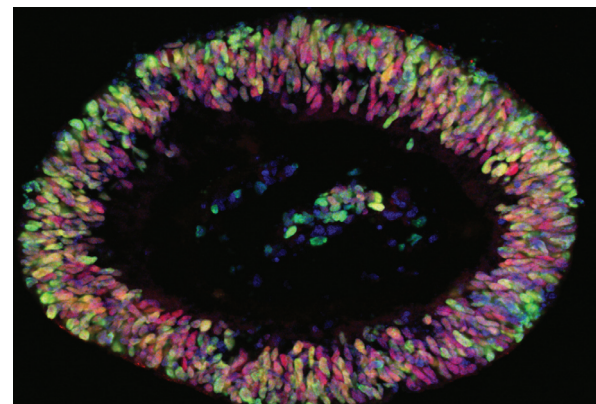
Cells open new possibilities for heart disease research, treatment

Researchers led by Craig January, Ph.D., and Timothy Kamp, M.D., Ph.D., professors of medicine at the UW School of Medicine and Public Health, are using iPS (induced-pluripotent stem) cell technology to make heart cells from skin cells. Their goal is to offer a cell model that will allow researchers to study disease mechanisms and new treatments and therapies for genetically-based heart diseases such as inherited arrhythmias.

Kamp, who directs the SCRMC, also presented advancements in using heart cells derived from stem cells to specifically study certain genetic mechanisms of heart diseases. He presented these results at the Annual Scientific Sessions of the Heart Rhythm society in May 2011.

Researchers connect through new groups

Five new Scientific Groups within the SCRMC will give researchers with similar interests better ways to connect with each other to collaborate, share resources and raise funds. SCRMC Associate Director Bill Murphy, Ph.D., associate professor of biomedical engineering, and also orthopedics and rehabilitation, is coordinating the groups.



This microscope photo shows human induced pluripotent stem cells beginning to form into a structure like a retina. This vesicle, or early retinal structure, formed in the laboratory into much the same shape that occurs in early eye development. The red cells are retina, and the green cells are rapidly dividing cells. Image courtesy of David Gamm Lab.

The groups and their leaders are:

- Stem Cell Bioengineering: Brenda Ogle, Ph.D., assistant professor of biomedical engineering.
- Cardiovascular Regeneration: Amish Raval, M.D., assistant professor of cardiology.
- Musculoskeletal Regeneration: Ben Graf, M.D., associate professor of orthopedics and rehabilitation.
- Molecular and Cellular Hematology: Emery Bresnick, Ph.D., professor of cell and regenerative biology.
- Neural Regeneration: Anita Bhattacharyya, Ph.D., senior scientist, Waisman Center.

Group leaders and participants are interested in hosting periodic mini-conferences and launching Internet discussion forums within and among the groups. These groups will ultimately serve as 'hubs' to connect researchers across the UW campus, resulting in new multi-investigator research initiatives.

JUN 11

Skin cell discovery targets eye diseases

Retina-like tissues can be produced from a patient's own skin, according to results reported June 15 in *Stem Cells* by stem cell scientist and ophthalmologist David Gamm, M.D., Ph.D., assistant professor of ophthalmology, and former UW scientist Jason Meyer, Ph.D. The investigators used human embryonic stem cells and induced pluripotent stem cells to generate three-dimensional structures similar to those present at the earliest stages of retinal development. The work lays the foundation for new treatments for blinding eye diseases.

The Gamm laboratory, based at UW-Madison's Waisman Center, isolated these early retinal structures from other cell groups and grew them in batches in the laboratory, where they produced major retinal cell types, including photoreceptors and retinal pigment epithelium. Importantly, cells from these structures matured and responded appropriately to signals involved in normal retinal function, making them potentially valuable not only for studying how the human retina develops, but also how to keep it working in the face of disease.

Outreach gives thousands a look at stem cell research

SCMRC's Stem Cell Learning Lab attracted more than 3,000 individual visitors from throughout the state during the past year. Jordana Lenon, B.S., who coordinates outreach for both the SCMRC and the Wisconsin National Primate Research Center, oversees the Stem Cell Learning Lab at the Biotechnology Center. Giving thousands more yet another opportunity for science outreach on campus – including stem cells but also much more – Rupa Shevde, Ph.D.,

directs the new education and outreach program at the Morgridge Institute for Research (MIR), part of the Wisconsin Institutes for Discovery. For example, the Pre-College Enrichment Opportunity Program for Learning Excellence program has an ongoing partnership with MIR to provide middle school girls with lab opportunities in Science, Technology, Engineering and Mathematics areas and, specifically, stem cell research.

JUL 11

Grants fund collaboration to encourage discovery

Twelve faculty teams from the University of Wisconsin-Madison and the University of Wisconsin-Milwaukee were awarded Intercampus Research Incentive Grants in July. Two of those teams include SCRMC faculty.

- Gold Nanorods for Targeted Cancer Theranostics: UW-Madison scientists Shaoqin "Sarah" Gong, Ph.D., associate professor of biomedical engineering, and Weibo Cai, Ph.D., assistant professor of radiology, are teaming up with Doug Steeber, Ph.D., associate professor of immunology at UW-Milwaukee.
- An EEG Triggered Robotic Stroke Rehabilitation Device: UW-Milwaukee's Ying-Chih Wang, OTR/L, Ph.D., assistant professor of occupational science and technology, and Brooke Slavens, Ph.D., assistant professor of occupational science and technology, are joined by UW-Madison's Justin Williams, Ph.D., associate professor of biomedical engineering, Vivek Prabhakaran, M.D., Ph.D., assistant professor of radiology, and Dorothy Edwards, Ph.D., professor of kinesiology and department chair.



Pictured through layers of glass, visitors tour one of three embedded teaching and outreach labs during the grand opening of the Wisconsin Institutes for Discovery at the University of Wisconsin-Madison on Dec. 2, 2010. Photo by Jeff Miller



The PEOPLE program has an ongoing partnership with the Morgridge Institute for Research to engage and educate girls in science, technology, engineering and math (STEM) and, specifically, in stem cell research. For the past two years, PEOPLE has partnered with the Institute to bring middle school participants in the Girls in STEM Workshop into laboratories for hands-on learning.

Photo by Valeria Davis.



Our Mission

The UW–Madison Stem Cell and Regenerative Medicine Center is an umbrella organization operating under the School of Medicine and Public Health and the Graduate School. The center provides a central point of contact, information and facilitation for all stem cell research activities on campus.

The center's mission is to advance the science of stem cell biology and foster breakthroughs in regenerative medicine through faculty interactions, research support and education.

Our Goals

- Maintain UW-Madison as the leader in stem cell and regenerative medicine research and application.
- Foster increased SCRMC communication within campus and beyond its borders.
- Support SCRMC research: basic, translational, clinical, bioethics and public policy.
- Develop educational, training and outreach programs.

Support Stem Cell Research

You can play a vital role in the future of stem cell research. Your investment in the Stem Cell and Regenerative Medicine Center will yield rewards that will change the future of medicine and health care.

Your gift can support

- basic, pre-clinical or clinical research
- education and training for students and post-doctoral fellows
- an unrestricted fund that gives the center maximum flexibility to take advantage of new opportunities.

For More Information

Visit our website at www.stemcells.wisc.edu.

Please contact Barb McCarthy at 608-265-5891 or barb.mccarthy@supportuw.org to learn how you can support stem cell research and regenerative medicine.

Center Contacts

Director: Timothy Kamp, M.D., Ph.D.,
tjk@medicine.wisc.edu

Associate Director: William Murphy, Ph.D.,
wlmurphy@wisc.edu

Program: Sue Gilbert,
ssgilber@wisc.edu

Outreach: Jordana Lenon, B.S., B.A.,
jlenon@primate.wisc.edu



1848 University Avenue, Madison, WI 53726-4090

608.263.4545 | uwf@supportuw.org | www.supportuw.org