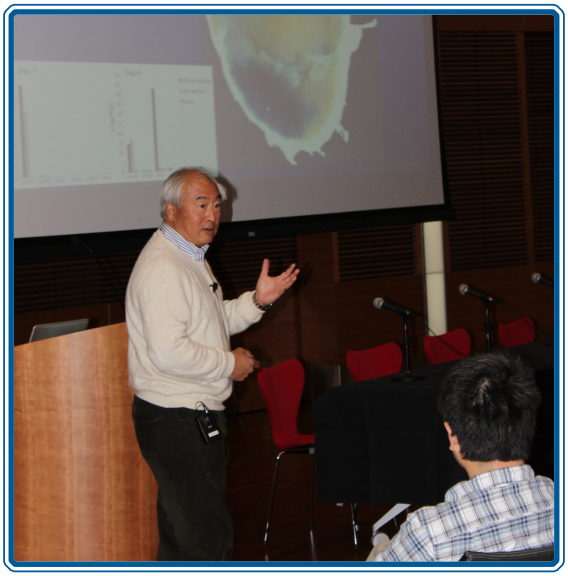
The mission of the UW Stem Cell and Regenerative Medicine Center is to advance the science of stem cell biology and foster breakthroughs in regenerative medicine through faculty interactions, research support and education.

Fall 2011

SCRMC Notes



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Dr. Kenneth Chien, Harvard Stem Cell Center, presenting keynote talk at the SCRMC Fall Conference *((Fall Conference photos by Jordana Lenon.)*

FROM THE DIRECTOR

Welcome to our Fall 2011 SCRMC newsletter. Please look at this newsletter to find out what's new at the SCRMC from new members to breaking research. Also learn what the center can do to help you from core services to pilot grants.

The fall semester got off to a good start with our first ever Fall Conference. The afternoon conference was organized by postdoctoral fellows, **Wei Shen** and **Sanal Kumar**, and took place at the Wisconsin Institutes for Discovery. It included an outstanding featured speaker, Dr. Kenneth Chien, from the Harvard Stem Cell Center as well as presentations by scientific focus groups and a panel discussion by representatives of stem cell-related industries. Scientific poster presentations capped the day.

Speaking of great meetings, mark your calendars for the 7th Annual Wisconsin Stem Cell Symposium, "Neural Stem Cells: Generation and Regeneration," on April 11, 2012. This symposium is organized by the neural regeneration focus group and promises to be a day of excellent scientific presentations and interactions.

The SCRMC scientific focus groups continue to grow and gain traction with the help of Associate Director **Bill Murphy**. They include Stem Cell Bioengineering, Cardiovascular Regeneration, Musculoskeletal Regeneration, Molecular and Cellular Hematology, and Neural Regeneration. These groups provide wonderful opportunities for researchers to learn about highly relevant and related science on campus and form new collaborations. If you are interested in participating in any of these groups, look for contact information inside.

Finally, the promise of stem cells and regenerative medicine continues to grow, but so do the challenges to reach the next level. The SCRMC is here to work together with you to help you take those next steps.

Tim Kamp

Number 5

FEATURED RESEARCHER



Randolph Ashton uses Toolbox of Techniques to Develop Synthetic Culture Systems

by Jordana Lenon

A heart attack patient would need approximately one billion cardiomyocytes to regenerate his ventricular myocardium. An adult with diabetes would need about the same amount in pancreatic beta cells to restore sufficient insulin production. Sixty to seventy percent of a Parkinson's patient's millions of dopaminergic neurons have already died before her first symptoms even appear.

That's a lot of cells, and not just any cells will do.

Randolph S. Ashton, Ph.D., assistant professor of biomedical engineering, wants to develop new tools and biomaterials for growing large amounts of clinically relevant heart, pancreatic, neural and other cells grown from human embryonic or induced pluripotent stem cells. To do this, he is investigating how to control extracellular micro-environmental cues, or the biochemical signals located within tissues to which stem cells sense and respond. He aims to optimize 2D cultures and 3D culture systems (bioreactors and tissue engineering scaffolds) for producing large amounts of clinically relevant therapeutic cells.

As part of the SCRMC campus seminar series, Ashton spoke Sept. 20 about his research experience and his goals as a new UW-Madison faculty member in the Department of Biomedical Engineering. His lab, part of the Bionates (Bio-Nanocomposite Tissue Engineering Scaffolds) theme led by Li-Sheng Turng, Ph.D., professor of mechanical engineering, is in the Wisconsin Institutes for Discovery. He will teach both undergraduate and graduate level courses related to tissue engineering, stem cell biology, and transport phenomena in the Engineering Centers Building.

Earlier this year, Ashton completed his Postdoctoral research on neurogenesis at the Berkeley Stem Cell Center, University of California, Berkeley. He has Ph.D. in chemical engineering as well as a strong background in understanding molecules the body uses, the cellular microenvironment, and stem cell culture conditions.

"Human pluripotent stem cells are the ideal source for generating scalable therapeutic cells due to their unlimited self-renewal potential and ability to differentiate into any cell type in the human body," Ashton explained. "However, our inadequate understanding of the molecular mechanisms that govern stem cell fate has precluded the development of fully-defined and scalable culture systems suitable for growing large quantities of therapeutically relevant cells."

To address this issue, Ashton aims to use a variety of high-throughput screening (HTS) methods to pinpoint molecular mechanisms that govern stem cell fate. He hopes to then engineer synthetic culture systems that predictably, safely, and efficiently instruct this same differentiation.

"We hope to design bioreactors for production of hPSC-derivatives at the scales required for clinical implementation of regenerative cell therapies," Ashton said. Furthermore, he explained that the development of mathematical models to rationally design synthetic biomaterials that instruct stem cell fate would contribute greatly to advancing the 'systems biology'

of stem cells, as well as to the overall fields of regenerative medicine and tissue engineering.

Pluripotent stem cells undergo specific patterns of proliferation, migration, and differentiation. To understand all this activity, the biochemical engineer must study relevant soluble factors, cell-to-cell interactions, and interactions outside the cell, in the extra-cellular matrix. As if that's not enough, he or she must also look at biophysical factors (shear, topography, and elasticity) in these microenvironments, as all these components actively instruct cell fate by regulating intracellular signaling pathways and controlling gene expression.

"We need to either discover novel genetic or micro-environmental factors, or optimize the quantitative and qualitative ways in which known factors are presented to cells," Ashton said. "Due to the complex nature in which these factors interact to instruct stem cell fate, the use of high-throughput screening platforms would facilitate a systems biology approach to successfully growing these cells."

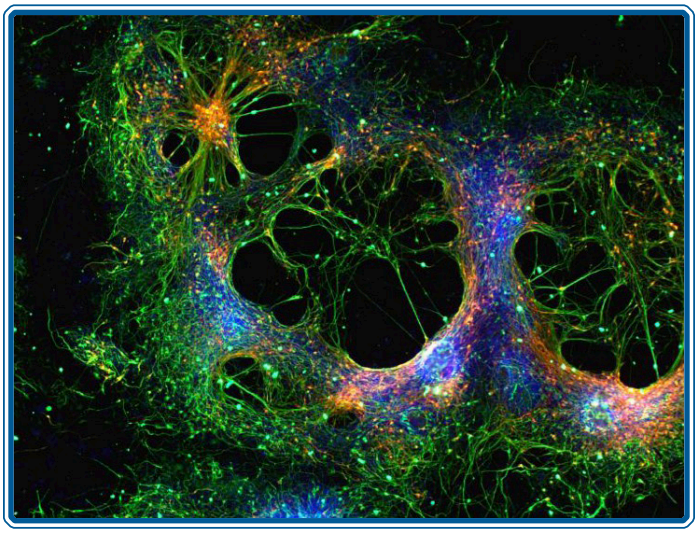
His goal is to combine different microenvironmental factors, and if necessary forced expression of genes known to enhance differentiation, into a highly efficient differentiation protocol.

Specifically, Ashton plans to engineer custom, microfabricated cellular microarrays and stem cell reporter lines for elucidating novel genetic and biochemical factors that regulate lineage-specific differentiation of hPSCs. For biochemical factors known to instruct hPSC differentiation, he aims to use a combination of cellular microarrays, microfluidics, and bioconjugate chemistry techniques to develop high-throughput screening platforms for systematically determining the precise quantitative and qualitative manner in which to present biomimetic forms of biochemical factors, and optimally instruct lineage-specific differentiation of hPSCs. He would use hydrogel culture systems in 2D and 3D as a final assay of how to qualitatively assess the viability of immobilized biochemical factors. These systems could also be used to quantify the influence of biophysical factors on biochemical factors.

Research Program Focus: Neuronal Differentiation

While Ashton is interested in collaborations to work with vascular and muscular cells, he initially plans to focus on the central and peripheral nervous systems and currently collaborates with Su-Chun Zhang, Ph.D., professor of neuroscience and neurology, in these regards.

Parkinson's disease is one interest: "No treatment prevents the progression of Parkinson's disease, but there is tremendous promise for developing regenerative cell therapies," Ashton said. This, he explained, is due to recent derivations of functional dopaminergic neurons from hPSCs and studies demonstrating that single transplants of hPSC-derived neural precursor cells, which give rise to midbrain dopaminergic neurons, or mDNs, decrease parkinsonian symptoms in rodent models, while transplants of fetal mDNs decrease symptoms in human patients. Thus, for Parkinson's, one of the final hurdles in developing stem cell-derived therapies is overcoming obstacles to efficiently deriving fully-defined and scalable culture systems.



A culture of hPSCs differentiated towards the dopaminergic fate : blue is a DNA/nucleus stain, green is beta-III tubulin, red is tyrosine hydroxylase *(Image courtesy Randolph Ashton.)*

Quartet of projects drives current goals

During his graduate and postdoctoral research years, Ashton gained extensive training in soft lithography techniques, protein engineering, polymer and bioconjugate chemistry, and stem cell and molecular biology. Four recent projects in particular laid the groundwork for his current work.

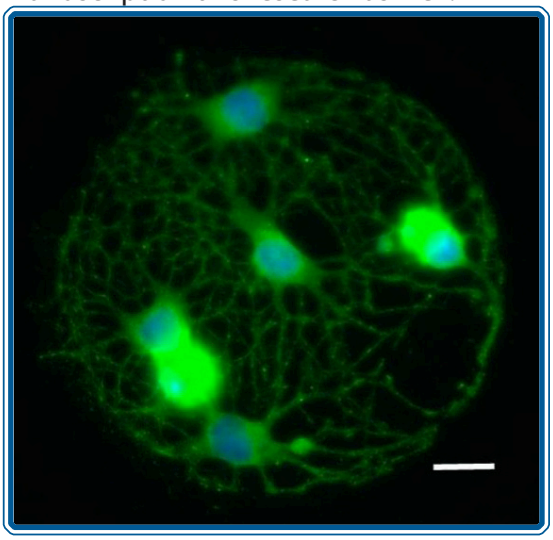
The first, involving microarray techniques, resulted in a paper on which he was lead author while a graduate student at the Howard P. Isermann Department of Chemical and Biological Engineering, Rensselaer Polytechnic Institute, in Troy, New York, and working in Ravi Kane's lab at Albany Medical College in New York. This article, "High-throughput Screening of Gene Function in Stem Cells Using Clonal Microarrays," was published in 2007, in Stem Cells.

The second project, involving biodegradable scaffolding for growing neural stem cells, also resulted in Ashton as first author on a paper that same year,

this time in Biomaterials and titled, "Scaffolds Based On Degradable Alginate Hydrogels and Poly(lactide-co-glycolide) Microspheres for Stem Cell Culture." In this paper, Ashton and his colleagues reported a significant increase in the expansion rate of neural progenitor cells cultured in degradable alginate (brown algae derived) hydrogels versus neural progenitor cells (NPCs) cultured in standard, or non-degrading, alginate hydrogels.

In a third project, Ashton focused on sonic hedgehog (Shh), a powerful morphogen known to control and spatially pattern several tissues during embryogenesis. He studied whether polyvalency regulates sonic hedgehog patterning of neuronal subtypes from hESCs. A manuscript is in preparation on this work.

Finally, Ashton investigated the role of Ephrin-B2 signaling in adult neurogenesis. Neural stem cells (NSCs) residing in the hippocampus constantly give rise to new neurons throughout adulthood , he explained. A number of soluble growth factors, delivered via systemic, paracrine, and autocrine routes, have been implicated in regulating this process, but, not many other factors of the cellular microenvironment (e.g. cell-cell contact pathways) are known to regulate NSCs in this process. Therefore, Ashton and colleagues turned their attention to studying Ephrin and Eph signaling, which is known to play a very active role in the developing CNS. "Eph/ephrin signaling controls cell migration, tissue segmentation and axonal guidance in the developing CNS", said Ashton. Since new research shows that hippocampal astrocytes regulate adult neurogenesis in a paracrine (signaling cell is close to target cell) fashion through the Wnt signaling pathway, Ashton hypothesized that astrocytes could also regulate neural stem cells directly through cell-to-cell contact signaling pathways. He investigated whether or not Eph/ephrin, a pathway known for patterning the topography of neuron axonal projections during development of the central nervous system, could directly regulate NSC neuronal fate commitment. Using rat models, he discovered with colleagues that Eph/ephrin plays an important role in increasing adult hippocampal neurogenesis in vivo by instructing NSC neuronal differentiation. He is preparing a manuscript on this research as well.



Adult rat hippocampus-derived neural progenitor cells (NPC) differentiated into neurons on a micro-patterned, cell-adhesion permissive, circular region of 100 microns in diameter. Blue dye stains the cells' nuclei; green dye stains βIII-Tubulin, a cytoskeletal protein indicative of neuronal cells. Scale bar is 10 micrometers.*(Image courtesy Randolph Ashton.)*

Progress and Prospects

Earlier this year, while in the Department of Chemical Engineering at the University of California, Berkeley, Ashton and scientists in the Departments of Bioengineering and Neuroscience reported on "Progress and Prospects for Stem Cell Engineering" in the Annual Review of Chemical and Biomolecular Engineering. The review addresses engineering approaches that have been developed to surmount obstacles to controlling the behavior of stem cells outside the body. The more researchers can learn about the stem cell niche – all the cell signals and other interactions that regulate stem cells in vivo – the better they can translate them into creating biomimetic or synthetic microenvironments to control cell behavior for biomedical applications.

APPLY FOR TRAINING FELLOWSHIPS NOW

The SCRMC Fellowship Program is an interdisciplinary pre- and post- doctoral program that aims to support the training of UW graduate students and postdoctoral fellows in interdisciplinary stem cell and regenerative medicine research. We are accepting applications until Jan. 1, 2012, for two one-year fellowship positions with the possibility of renewal for a second year. Applications will be reviewed by Jan. 15, 2012. Visit **http://stemcells.wisc.edu/education/** for more details.

"Many studies in this review demonstrate that cells sense and respond to features on the nano-to-micrometer scale," Ashton said. "Therefore, homogeneity in the quantitative, qualitative, and temporal properties of microenvironmental factors between various experiments will facilitate data comparison and modeling efforts."

The review describes engineering high-throughput methods to investigate stem cell regulation, such as microarrays and microfabrication using soft lithography; it also describes computational and mathematical modeling methods to understand stem cell behavior. The section, "Engineering The Stem Cell Microenvironment" includes biochemical regulation methods such as adhesive ligands, immobilization of growth factors and morphogens. For example, Shh covalently linked to a polymer hydrogel surface promotes osteogenic (bone) differentiation of hMSCs.

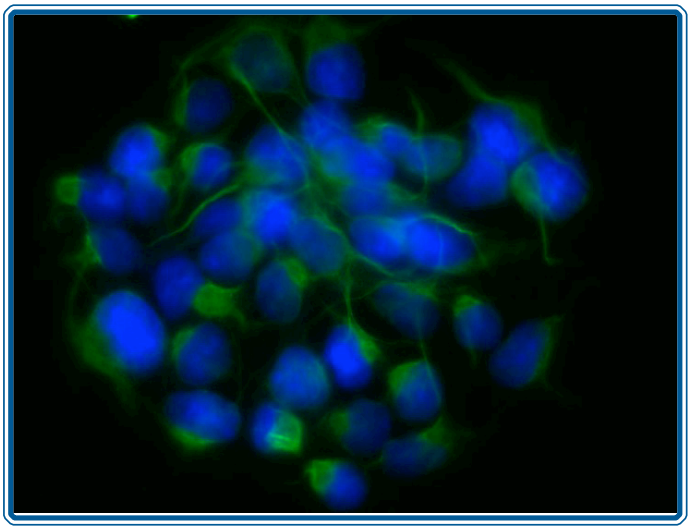
Stem cell niches are not only incredibly diverse biochemically, but in their biophysical properties as well, Ashton and his co-authors described in the review: Most apparent are differences in stiffness and topography of different tissues as well as the forces imparted during the natural motions of organisms including joint bending, muscle contraction, compressive impact and strain on tissues, and pulsatile flow of the circulatory system.

Regarding stiffness, many of the first engineered microenvironments mimicking the high water content of natural tissues were hydrogels composed of natural polymers such as collagen and hyaluronan. However, synthetic materials such as polyacrylamide and poly(ethylene glycol) provide several advantages over natural ones, the reviewers highlighted, including the ability to generate a wide range of possible stiffnesses while maintaining constant biochemical properties.

Another recommendation: Stem cell bioreactors will require control of other parameters not traditionally considered during bench-scale tissue culture, such as pH, agitation-induced shear, and dissolved oxygen. For example, stem cells in the developing embryo and in the adult brain function at oxygen levels much lower than those of standard culture conditions, and oxygen levels are known to regulate stem cell proliferation and differentiation in vitro.

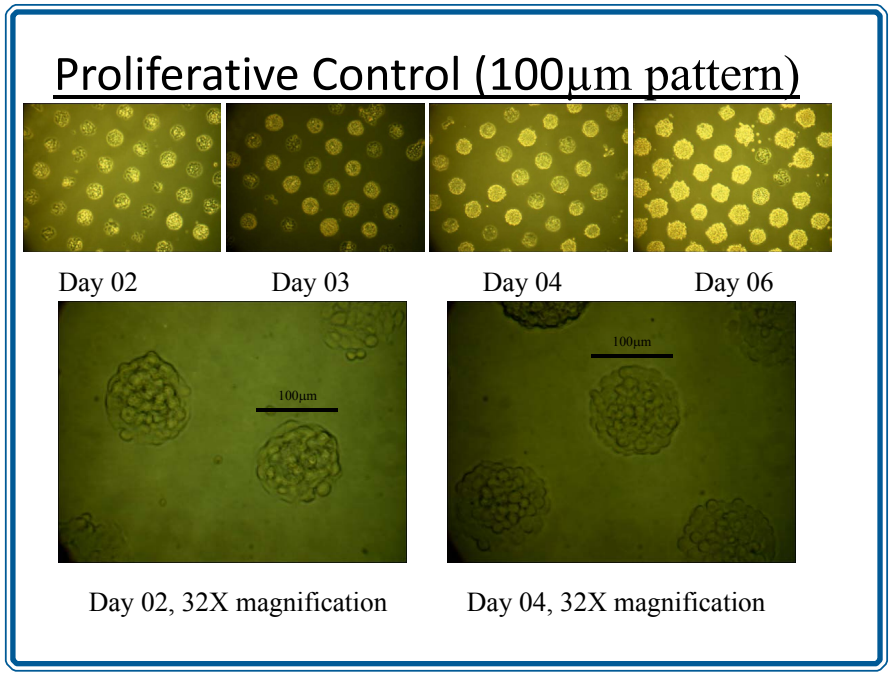
"Large-scale stem cell bioreactors could produce therapeutic cells at this scale for numerous patients in a cost effective, pathogen-free, and reproducible manner," Ashton said. "Also, it is imperative that materials used for stem cell culture and differentiation are fully defined and produced via synthetic or recombinant means, so no feeder cell layers, conditioned media, or animal or human-derived serum or proteins."

In summary, Ashton aims to build upon four advances in the field of bioengineering as they relate to growing mass quantities of clinically relevant stem cell derivatives: The first is that engineered high-throughput platforms, such as microarrays, micropatterned surfaces, and microfluidics, are extremely helpful for investigating the myriad factors that regulate stem cell fate. Second, systems biology and computational



Adult rat hippocampus-derived neural progenitor cells (NPC) cultured on a micro-patterned, cell-adhesion permissive, circular region of 100 microns in diameter. Blue dye stains the cells' nuclei; green dye stains Nestin, a cytoskeletal protein indicative of immature cells. *(Image courtesy Randolph Ashton.)*

approaches for modeling stem cells facilitate understanding these complex and nonlinear systems and elucidating non-intuitive interactions between intracellular signaling pathways. Third, engineered materials provide exquisite control over the biochemical and biophysical aspects of the stem cell microenvironment, and they can be used to reveal the molecular mechanisms that regulate stem cell fate. Finally, for clinical-scale production of stem cell–derived therapies, single-phase and two-phase bioreactor designs will need to incorporate the aggregate knowledge obtained from stem cell studies, assisted by high-throughput screening, computational approaches, and engineered cell microenvironments, to control stem cell fate effectively.



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Wall ST, Saha K, **Ashton RS**, Kam KR, Schaffer DV, Healy KE. Multivalency of Sonic hedgehog conjugated to linear polymer chains modulates protein potency. *Bioconjug Chem. 2008 Apr;19(4):806-12. Epub 2008 Apr 2.*

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Ashton RS, Peltier J, Fasano CA, O'Neill A, Leonard J, Temple S, Schaffer DV, Kane RS. High-throughput screening of gene function in stem cells using clonal microarrays. *Stem Cells. 2007 Nov;25(11):2928-35. Epub 2007 Aug 2.*

Adult rat hippocampal neural stem cells cultured on micropatterned surfaces in a format amenable to high-throughput screening. *(Related to Stem Cells publication—see above.) (Image courtesy Randolph Ashton.)*

SCRMC Scientific Focus Groups Update

Our five new Scientific Focus Groups are building steam under the direction of new SCRMC Associate Director **William L. Murphy**., Ph.D., Associate Professor of Biomedical Engineering. "Our goal is to bring together researchers with similar interests from across campus to improve communication, collaboration, resource sharing, fund raising and other activities within these specialized groups," says Murphy.

The five groups and their chairs are:

* Stem Cell Bioengineering: **Brenda Ogle**, Assistant Professor of Biomedical Engineering
* Cardiovascular Regeneration: **Amish Raval**, Assistant Professor of Medicine
* Musculoskeletal Regeneration: **Ben Graf**, Associate Professor of Orthopedics and Rehabilitation
* Molecular and Cellular Hematology: **Emery Bresnick**, Professor of Cell and Regenerative Biology
* Neural Regeneration: **Anita Bhattacharyya**, Senior Scientist, Waisman Center

Group chairs will first work with center staff to put in place administrative support for these groups and also link them to other established research groups on campus with similar interests to aid their development. The second phase of growth requires creating web sites to facilitate organization, communication and fundraising for each group and its members. Third, the center will help establish pilot grant programs and other logistical support for these scientific groups. The groups will steer their own direction, using center staff and resources to assist them, to establish leadership, meetings, goals and activities with the common goal of furthering all stem cell and regenerative medicine research on campus.

"Our goal is not to have the center take ownership of these scientific focus groups, but to interact with them and help them grow," Murphy said. "Ideas from those interested in forming and participating in these groups so far have included hosting periodic retreats and 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."

*Remember: You can help keep our **website** up to date by sending **Sue Gilbert** updates for your webpages and **job announcements**.*

Stem Cell & Regenerative Medicine Center
UNIVERSITY OF WISCONSIN–MADISON

THE UNIVERSITY of WISCONSIN MADISON

*Questions about this newsletter? Please contact **Sue Gilbert***
*Editor: **Jordana Lenon***
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Fall Conference Recap

The SCRMC Postdoctoral Fellows, **Wei Shen**, Ph.D. (**David Gamm**'s lab), and **Sanal Kumar**, Ph.D. (**Emery Bresnick**'s lab), and SCRMC staff would like to thank all of those who attended our Fall Conference Sept. 16 at the Wisconsin Institutes for Discovery. We welcomed more than 200 attendees before the keynote address, including faculty and staff, 40 postdocs, 60 graduate students and 25 undergrads from all over campus, plus a few guests. Twenty posters surrounded the H.F. DeLuca Forum—congratulations to **Ksenija Bernau** from **Masatoshi Suzuki**'s comparative biosciences lab, and **Justin Koepsel** from **Bill Murphy**'s biomedical engineering lab for their winning posters!

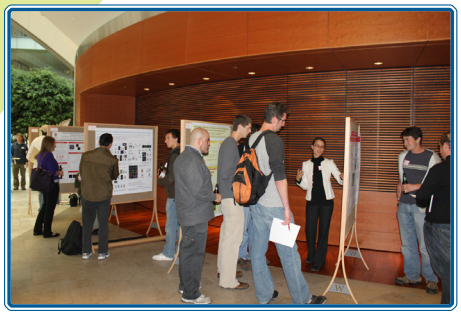
We are grateful to **Kenneth Chien**, Director, Massachusetts General Hospital Cardiovascular Research Center, for his keynote address, "Driving heart progenitor fate in vivo with modified mRNA." We also wish to thank **Ben Graf** and the Musculoskeletal Regeneration Focus Group for their summary presentation, industry panel participants, and everyone else who helped make this event a success. (We also heard that the food, beverages and take-away SCRMC mugs were a big hit!)

Event feedback indicates that the conference was a success, so we've started to plan a similar event for next fall and we welcome your suggestions throughout the year.









SCRMC/ICTR 2011 Pilot Grant Awards and Call for 2011 Proposals



The SCRMC once again partnered with the UW-Madison Institute for Clinical and Translation Research (ICTR) for its pilot grant award program. These $50,000 one-year, Type 1 pilot grants support basic research, clinical trials, and research where a basic laboratory discovery may lead to the prevention, diagnosis, or treatment of a specific disease. Type 1 funding also supports a wide spectrum of patient-oriented research that embraces innovations in technology and biomedical devices. The grant program is targeted at new investigators or investigators taking a new direction. The program provides peer review of applications. For 2011, the SCRMC jointly supported three grants. ICTR funded an additional grant to an SCRMC members with other co-funding. The proposals funded were:

Wan Ju Li; Orthopedics and Rehabilitation, SMPH
Co-funding: UW Stem Cell & Regenerative Medicine Center; UW ICTR
Induced Pluripotent Stem Cells Differentiated In Engineered Matrix With A Bio-Inspired Surface For Tendon Regeneration
Using stem cells to regenerate new tendon ex vivo for surgical transplantation is considered a promising solution to offset the limited supply and tissue morbidity associated with auto- and allografts. The team will use an interdisciplinary approach to test the use of a novel nanofibrous scaffold in a unique microenvironment to induce pluripotent stem cells to form functional tendon.

Masatoshi Suzuki; Comparative Biosciences, SVM
Co-funding: UW Stem Cell & Regenerative Medicine Center; UW ICTR
In Vivo Tracking Of Human Neural Progenitor Cells In ALS
Stem cell therapy has become increasing attractive for the treatment of ALS, in particular, using stem cells to act as long-term "mini-pumps" to release needed growth factors. Nonetheless, a major drawback to using stem cells in this manner is the difficulty in tracking the cells and monitoring their activity once transplanted. This project aims to develop a novel imaging method for these cells in a rat animal model of ALS.

Weibo Cai; Radiology, SMPH
Co-funding: UW Carbone Cancer Center; UW ICTR
Targeting Tumor Vasculature With Biodegradable Zinc Nanowire
Chemotherapy of metastatic cancer is rarely curative and has significant toxicity. Development of a biodegradable, tumor-vasculature targeted drug delivery platform will substantially improve cancer patient management. Zinc oxide (ZnO) is a biocompatible material with low toxicity and high biodegradability. The objective of the project is to develop ZnO and optimize its non-invasive tracking with multiple imaging modalities.

Ron Kalil; Ophthalmology and Visual Sciences, SMPH
Co-funding: UW Stem Cell & Regenerative Medicine Center; Coalition for Brain Injury Research; UW ICTR
Transplantation Of Human Neural Progenitor Cells To The Injured Adult Rat Brain
The loss and subsequent inability to replace injured neurons complicates efforts to mitigate the long term effects of traumatic brain injury. Transplantation of neural progenitor cells (eNPC) derived from human embryonic stem cells may result in the replacement of lost neurons, helping to restore more normal brain function. The team will simulate brain injury in a rat model and determine whether transplanted human eNPCs differentiate into neurons and the degree of synaptic integration.

Congratulations to the awardees for their excellent proposals. The program moves forward again this year with the SCRMC supporting two pilot grants. Letters of intent are due December 1, 2011. Go to the **ICTR website** for more information.

News Briefs

Human brain's most ubiquitous cell cultivated in lab dish

May 11, 2011 by Terry Devitt, UW Communications

Pity the lowly astrocyte, the most common cell in the human nervous system.

Long considered to be little more than putty in the brain and spinal cord, the star-shaped astrocyte has found new respect among neuroscientists who have begun to recognize its many functions in the brain, not to mention its role in a range of disorders of the central nervous system.

Now, writing in the current (Sunday, May 22) issue of the journal *Nature Biotechnology,* a group led by University of Wisconsin-Madison stem cell researcher **Su-Chun Zhang** reports it has been able to direct embryonic and induced human stem cells to become astrocytes in the lab dish.

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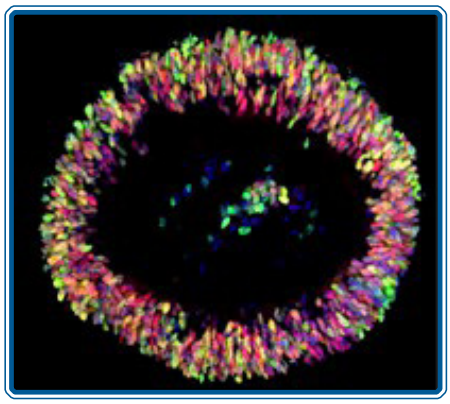
Stem Cells from Patients Make 'Early Retina in a Dish'

June 15, 2011 Courtesy School of Medicine and Public Health

Madison, Wisconsin - Soon, some treatments for blinding eye diseases might be developed and tested using retina-like tissues produced from the patient's own skin, thanks to a series of discoveries reported by a team of University of Wisconsin-Madison stem cell researchers.

The team, led by stem cell scientist and ophthalmologist **David Gamm**, M.D., Ph.D., assistant professor of ophthalmology and visual sciences, and former UW scientist **Jason Meyer**, Ph.D., (now at Indiana University) used human embryonic stem (ES) cells and induced pluripotent stem (iPS) cells to generate three-dimensional structures that are similar to those present at the earliest stages of retinal development.

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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.)*

Vote for your SCRMC Executive Committee

All SCRMC members contribute and benefit from the center, but we especially receive leadership and guidance from our executive committee. Current members are **Tim Kamp** (Medicine), **Erik Forsberg** (WiCell Research Institute), **Bill Murphy** (Biomedical Engineering), **Linda Hogle** (Medical History and Bioethics), **Emery Bresnick** (Cell and Regenerative Biology), **Derek Hei** (Waisman Center) and **Su-Chun Zhang** (Waisman Center). These faculty members have dedicated precious time to help the SCRMC thrive.

Current nominees to succeed Derek Hei, beginning January 2012, are **Craig Atwood** (Medicine), **Peiman Hematti** (Medicine), **Judith Kimble** (Biochemisty), **Sean Palecek** (Chemical and Biological Engineering), and **Igor Slukvin** (Pathology and Laboratory Medicine.) Please respond to the poll by November 30.

We would also like to thank departing committee member Derek Hei, Ph.D., for his three years of service.

Heart cells derived from stem cells used to study heart diseases

May 6, 2011 Courtesy School of Medicine and Public Health

A research team at the University of Wisconsin School of Medicine and Public Health became the first to use heart cells derived from stem cells to specifically study certain genetic mechanisms of heart diseases. 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 iPSC (induced-pluripotent stem cell) technology to make heart cells from skin cells. Their goal is to offer a cell model allowing researchers to study disease mechanisms, and new treatments and therapies for genetically based heart diseases such as inherited arrhythmias.."

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UW-Madison, UW-Milwaukee award inter-institutional research grants

July 28, 2011 by UW Communications and SCRMC staff

Combining research talents from two institutions can only help accelerate discoveries. Two of 12 faculty teams from the University of Wisconsin-Milwaukee (UWM) and the University of Wisconsin-Madison that were awarded Intercampus Research Incentive grants include SCRMC faculty:

* Multifunctional 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**, 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.

Find the University of Wisconsin Stem Cell and Regenerative Medicine Center on Facebook. Join nearly 400 followers keeping up with seminars, news and more.

Chinese high schoolers to learn from stem cells

July 26, 2011 by Jennifer Sereno (and updated for this newsletter)



(Photo by Valeria Davis)

Eighteen students participating in the inaugural Global Wisconsin Idea Program -- a unique pairing of American and Chinese teenagers -- joined a Chinese university dean July 27 to learn more about the science of stem cells during a hands-on workshop hosted by the Morgridge Institute for Research.

The workshop was part of a three-week residential program that challenged students to explore global issues of sustainability and the promise of solutions among a variety of emerging research and technologies.

Read More

Wendy Crone, Tom Keenan win Engineering Beyond Boundaries Awards

Check out **Engineering Beyond Boundaries** (EB2) to read about the new innovative ideas hatched by award winners and SCRMC members **Wendy Crone**, Ph.D., professor of engineering physics, biomedical engineering, and materials science and engineering, and **Tom Keenan**, Ph.D., assistant scientist, biomedical engineering and neurology, in the lab of **David Beebe**, Ph.D., professor of biomedical engineering.

Crone and Biomedical Engineering Associate Professor **Naomi Chesler**, working with top experts from on and off campus, created an on-line video library of two dozen lectures covering core principles of design;

including communication, design considerations, the design process, patents and literature. View the library **here**.

Keenan and Beebe developed Engineering and Biology: Technological Symbiosis (INTEREGR 301). The two recruited more than two dozen undergraduate students to help develop content, envisioning that someday a course integrating engineering and biology could be required. Presently, the course counts as an elective in most College of Engineering departments.

Engineering Beyond Boundaries (EB2) is a new, long-term educational transformation initiative in the College of Engineering. The program and its awards are intended to encourage faculty and staff to rethink our academic culture to address important shifts that go beyond traditional engineering boundaries.

University biomedical emphasis a big economic winner for Wisconsin

April 19, 2011 by Dave Tennenbaum

As Wisconsin struggles with unemployment and anemic growth, a group of health-related university spin-offs continues to benefit from UW-Madison's profound depth in biological sciences, medicine and engineering.

The spin-off businesses focus on everything from regenerative medicine to influenza and infection. Some are in the start-up phase; others have been successful enough to be acquired by multinationals.

Read More



Students from Wisconsin biotech companies work in the Biomanufacturing Teaching Lab of the M.S. in Biotechnology Program at UW-Madison in July 2009. The degree program is housed in the MG&E Innovation Center. From the left are **Maya Fuerstenau-Sharp**, senior product development specialist at Cellular Dynamics International; **Jared Finger**, lab manager and scientist at Cell Line Genetics; and **Seth Taapken**, laboratory manager at WiCell Research Institute. *(Photo by Joe Rashid.)*

Stem Cell Awareness Day meets Wednesday Night at the Lab

William L. Murphy, Ph.D., associate professor, biomedical engineering and orthopedics, and associate director, Stem Cell and Regenerative Medicine Center, presented, "Progress toward using stem cells to make tissues," on World Stem Cell Awareness Day (Oct. 5). The event was part of UW-Madison Biotrek Outreach Program's "Wednesday Night at the Lab" public outreach series, sponsored by the Wisconsin Alumni Association and free to the public. A record WNTL audience of 127 attended the talk.

Following Murphy's talk, SCRMC outreach coordinator **Jordana Lenon**, B.S., and students from the Student Society for Stem Cell Research (SSSCR) served up hands-on Stem Cell Learning Lab activities and discussions for 40 participants. Bill and his pre-doctoral fellow Eric Nguyen, Ph.D., joined in to assist with the outreach lab portion as well.

Watch Murphy's Stem Cell Awareness Day presentation **here.** *(Search recorded lectures at bottom of page.)*

Rural Wisconsin high school students learn with stem cells, top UW–Madison researchers

July 11, 2011 (Courtesy UW Communications news)

Twenty top science students from rural Wisconsin high schools earned the opportunity to hone their laboratory skills and worked alongside top researchers from the University of Wisconsin–Madison at a summer science camp focused on stem cells. Hosted by the **Morgridge Institute for Research**, a nonprofit biomedical research institute affiliated with UW–Madison, the four-day summer science camp began on July 11 and covered a variety of hands-on activities. Among them: nourishing and dividing colonies of stem cells and learning how the cells can be directed to grow into heart, nerve and other specialized cells.

Read more

The Year in Stem Cells 10/11

A report on progress in stem cell and regenerative medicine research, education and outreach at the UW-Madison, produced by the University of Wisconsin Foundation and the SCRMC. *Click on the image to the right to link to the report.*



7th Annual Wisconsin Stem Cell Symposium

April 11, 2012
BioPharmaceutical Technology Center Institute, Madison, WI

Neural Stem Cells: Generation and Regeneration

Save the Date

Here's a sneak preview of comfirmed speakers so far:

Rudolph Jaenisch, MIT: iPSC, Epigenetics
Yoshiki Sasai Riken, Kobe, Japan: Neurogenesis
Xinyu Zhao, UW-Madison: Adult Stem Cells
David Schaeffer, UC-Berkeley: Stem Cells, Neural Microenvironment
Robin Franklin, Cambridge, UK: Endogeneous Cell Repair, Remyelination
Dave Gamm, UW-Madison: Rransplantation, Retina

In an effort to foster communication, conference organizers from BTCI, SCRMC and WiCell plan to organize lunches for Postdoctoral trainees and graduate students who preregister and request to have lunch with a specific speaker.

To increase visibility and enthusiasm for posters at the symposium, the poster session will be a competition (such as the successful event at the SCRMC Fall Conference at WID). Prizes will be announced: the top three poster winners will also be invited to give a short talk at the symposium.



Updates from

WiCell® Research Institute

WiCell's Spring street facility has temporarily relocated to Morgridge Research Park (MRP). While WiCell continues to search for a permanent location closer to campus, the MRP facility offers research and culture space to UW investigators involved in stem cell research. Clinical grade hES cells and matched research banks produced in collaboration with Waisman Biomanufacturing are now available through WiCell's WISC Bank. Additionally, a new collaboration with Dr. **Su-Chun Zhang** and the Waisman Center's iPS Core will soon offer iPS derivation, characterization and banking services to the UW-Madison Campus. Together these offerings represent the next step toward clinical application of stem cell technologies for Wisconsin researchers. Finally, WiCell's Core is now offering frozen vials of Wisconsin cell lines (ES, modified ES, and iPS) to UW researchers at $100 per vial. This represents a 90% discount to UW researchers on these WISC Bank cell lines compared to non-UW investigators. Please contact **CoreServices@WiCell.org** for the new order form to request frozen materials. Live cultures of cell lines actively grown in the laboratory (WA09, WA01, IMR90-4 and occasionally others) will still be available free of charge upon request by emailing **CoreServices@WiCell.org**. Completing an order form for live cultures is not required.

Welcome new SCRMC members!

Faculty and Staff:

Randolph Ashton, Biomedical Engineering
Craig Atwood, Medicine, Wisconsin Alzheimer's Institute
Stacey Brickson, Orthopedics & Rehabilitation, Physical Therapy
Seth Dailey, Surgery, Otolaryngology
Shaoqin 'Sarah' Gong, Biomedical Engineering and WID
Kenneth Lee, Diagnostic Radiology
Entela Lushaj, Surgery, Division of Cardiothoracic
Mark Markel, Medical Sciences
Heather McFadden, Graduate School Office of Research Policy
Joan Parrish, Animal Sciences
Linda Schuler, Comparative Biosciences
Michael Schwartz, Biomedical Engineering
Raghu Vemuganti, Neurological Surgery
Justin Williams, Biomedical Engineering
John Wilson, Orthopedics & Rehabilitation, Family Medicine
Xinyu Zhao, Neuroscience, Waisman Center

Students and postdoctoral fellows:

Abraham Al-Ahmad, Chemical and Biological Engineering *(Shusta lab)*
Asuka Eguchi, Cellular and Molecular Biology *(Ansari lab)*
Connie Chamberlain, Orthopedics and Rehabilitation *(Murphy/Vanderby/Baer labs)*
Weixang Guo, Postdoctoral fellow, Neuroscience *(Zhao lab)*
Taylor Horowitz, Junior in Biology *(CALS)*
Garrett Lee, Cellular and Molecular Biology *(Ansari lab)*
Emily Leung, Junior in Biology with Neurobiology
Chelsie Maguire, Medical Microbiology and Immunology
Darilis Suarez-Gonzalez, Biomedical Engineering *(Murphy lab)*
John Vandenhouten, incoming freshman
Letitia Wong, PhD candidate in Molecular and Environmental Toxicology
Haibin Zhao, Materials Engineering *(Turng lab)*

SCRMC Member Services

The following core services are available to SCRMC members and appear on our website at www.stemcells.wisc.edu/research/.

- Immunology and Pathology Services
- Nonhuman Primate Services
- Cellular and Molecular Imaging Services
- Small Animal Imaging Services
- WiCell Research Institute and WiscBank
- Research Materials and Services
- Training Courses

...and more