

Genetics

AT UW - MADISON

WINTER 2009

FROM THE CHAIR: MICHAEL R. CULBERTSON

2008 was a remarkably eventful year for the Laboratory of Genetics. As you will discover in this newsletter, a large number of faculty members, academic staff members, and graduate students were honored with awards of distinction recognizing their efforts in research, department support services, and graduate studies. As a whole, members of the Laboratory of Genetics were successful in competitively renewing research grants in a very difficult national financial environment. No

matter how high the bar has been set, our faculty and students have risen to the challenge and remain successful at garnering new funding and renewing funding of ongoing research projects.

From the perspective of the Chair, one of the most significant challenges of 2008 has centered on the funding of graduate programs on the UW campus. The National Institutes of Health instituted new policies including caps on tuition and fringe benefits that can be paid on behalf of graduate students from federal training grants. There are 32 NIH training grants on campus, including the grant that funds the Genetics Training Program and which provides support for the first two years of graduate study in genetics for domestic students. In total, the new caps created a campus-wide multi-million dollar shortfall in the institutional support needed to maintain NIH training programs.

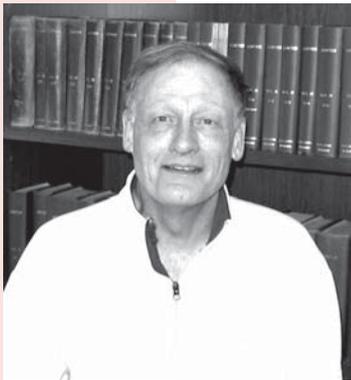
To deal with this challenge, I sought and accepted a position in the College of Agricultural and Life Sciences (CALs) to serve as the first Director of the Office of Graduate Studies and Professional Development, a role I felt I could manage while still remaining Chair of the Laboratory of Genetics and while maintaining my own research laboratory. The office will help promote the inter-

ests of graduate students on the UW campus. To learn more, go to <http://www.cals.wisc.edu/gradstudies/>. My first task as Director was to work with a campus-wide group appointed by Provost Patrick Farrell to review the financial situation regarding training grants and to find solutions. The net result was the inclusion of a multi-million dollar package in what is called "The Madison Initiative", which will be considered by the Wisconsin Legislature during the next biennial budget deliberations. Although the final fate of this solution is not yet known, it has been approved by the Board of Regents and the UW System.

Support of our graduate program is at the very cornerstone of our mission. We not only train the scientists of the future, but our current research efforts depend heavily on the efforts of graduate students working at the bench. Overall, about three-fourths of all the research done in the Laboratory of Genetics is performed by graduate students. They are our top priority. I plan to continue working on a campus-wide level through the Office of Graduate Studies and Professional Development to ensure the financial stability of our graduate programs.

Finally, I want to highlight a significant event coming up in 2010. As you will read below, we will celebrate milestone anniversaries of the establishment of Genetics on the UW campus- the 100th anniversary of Genetics in CALs and the 50th anniversary of Medical Genetics in the School of Medicine and Public Health. Special events will be held on campus including a symposium. Save-the-date postcards have been mailed. If you have not received one or wish to contact me about this or any other issue related to UW Genetics, please do not hesitate to contact me at mrculber@wisc.edu. ■

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Laboratory of Genetics
425-G Henry Mall
Madison, WI 53706-1580

Tel: 608-262-1069
Fax: 608-262-2976

Laboratory of Genetics Updates

Genetics Welcomes New Faculty Members



This past year, Genetics Trainer **Scott Kennedy** (PhD 1998, University of Chicago) assumed a joint appointment in the Departments of Medical Genetics and Pharmacology, and relocated his research group to the Laboratory of Genetics. Using forward genetic screens in *C. elegans* Scott and his co-workers have discovered a collection of genes involved in RNA interference, a process in which small double-stranded RNAs direct the destruction or silencing of cognate messenger RNAs. RNA interference was originally thought to be confined to the cell cytoplasm but Scott's group discovered an RNA-induced silencing complex (or RISC) that acts within the nucleus. The

functions and targets of this novel nuclear RISC are still somewhat mysterious and the subject of ongoing work in the Kennedy lab. Before coming to Madison in 2004, Scott trained as a postdoc at Harvard with Gary Ruvkun. ■

Kate O'Connor-Giles (PhD 2003, Washington University) will begin an appointment as a new tenure-track Assistant Professor on July 1, 2009. Kate is using *Drosophila* as a system for identifying genes involved in synapse growth, a process that underlies neuronal development, learning and memory. As a postdoctoral fellow working with Barry Ganetzky, Kate discovered that synapse growth at the neuromuscular junction depends on presynaptic recycling of BMP receptors. She also found that retrograde BMP signaling acts locally within axons to promote synaptic growth, a process that appears to be distinct from the canonical pathway of BMP signal transmission to the cell nucleus. Using genetic and biochemical screens, Kate is identifying additional genes involved in synapse growth. ■



A Bird's Eye View of Genetics



2008 marked the 20th anniversary of *Perspectives on Genetics*, published monthly in *Genetics* and edited by UW Genetics Professors **Jim Crow and Bill Dove**. In 1986, *Genetics* editor John Drake asked Jim and Bill if they would serve as editors for a new series of essays under the heading "Perspectives: Anecdotal, Historical and Critical Commentaries on Genetics." The ensuing series included many essays authored by the editors themselves, including an astounding 47 historical accounts from Professor Crow, who marked his own 93rd birthday celebration in 2009. This January, Crow and Dove passed the editor's torch to distinguished author and editor Adam S. Wilkins, whose ties to the UW genetics

community go back to a postdoctoral stint in the Dove lab in the early 1970s. Now free from editorial duties, will Crow and Dove find time to contribute new *Perspectives* essays at an even greater rate? Stay tuned! ■

2007 Nobel Prize in Medicine Awarded for Development of Gene Targeting

Former UW Genetics Professor **Oliver Smithies** shared the 2007 Nobel Prize in Medicine for development of gene targeting in mice, work that was initiated and largely performed in his lab at UW prior to departing for the University of North Carolina in 1988. Smithies' method for targeted gene disruption by homologous recombination transformed medical research by enabling geneticists to investigate thousands of genes shared by mice and humans for which genetic or biochemical functions had yet to be discovered. Oliver continues to maintain close ties with his friends here in Madison and generously donated a portion of his Nobel Prize to the Laboratory of Genetics in support of an annual symposium primarily intended to be for the benefit of students. The inaugural Oliver Smithies Symposium was held on the UW campus May 29, 2008 and featured lectures by Dr. Lee Hood (Institute for Systems Biology) and Prof. Smithies himself. Oliver's virtuoso presentation, "Turning Pages", was an inspirational reprise of his Nobel Lecture, in which many gems of insight and poignant humor were directed specifically to the many students packing the auditorium. ■



Oliver Smithies met with Genetics graduate students over lunch to hear about their research projects in May 2008.

Crow Fund Reaches Halfway Mark



In celebration of his 93rd birthday, Jim Crow arranged a concert for the department. Joining him are Krista Stewart (violin) and John Yin (cello). They played three movements of the Dohnanyi Serenade, Opus 10 to an admiring crowd.

The James F. Crow Distinguished Professorship Fund was established in honor of James F. Crow, a pre-eminent geneticist who has served as a faculty member at UW since 1948. Although retired, he remains active as an emeritus faculty member (an understatement – see “A Bird's-Eye View” on the previous page). An icon in the field of genetics, Professor Crow has published over 200 papers covering topics in population genetics, fruit fly genetics, and, most recently, historical essays. Generations of students remember him as one of their finest teachers. Having worn many administrative hats (Genetics Departmental Chair, Acting Dean of the UW Medical School, and chair of numerous review panels and National Research Council advisory committees) Professor Crow has long functioned as a

senior statesman of science. His many honors include election to the National Academy of Science and to the Royal Society. Jim is also an accomplished musician having been a member of the Madison Symphony Orchestra and past President of the Madison Civic Music Society. To honor Professor Crow, a fund has been established to create an endowed Professorship that bears his name. We are about half way to our goal to fully fund the professorship with a \$1 million dollar endowment. Once the goal is reached, the Professorship will be made available to attract a world-class scientist to join the faculty in Genetics. The earnings of the endowment will be made available to support the research of the recipient. Please join us in celebrating the career of Dr. Crow by contributing to the James F. Crow Professorship Fund. Information on how to make a donation may be found at <http://www.genetics.wisc.edu/>. Under “Academic Programs”, click on the Alumni link and find the link “Make a Donation to Genetics Online”. You will find four Fund accounts that serve different purposes, including the Crow Distinguished Professorship Fund, the Laboratory of Genetics Fund, the William H. Stone Student Scholarship Fund, and the Genetics Training Fund. The links to each fund will take you directly to the UW Foundation Website. ■

Kellet Mid-career Award Recognizes William Engels for Insights into Genome Plasticity



Bill Engels and long time colleagues Christine Preston (rear right) and Carlos Flores and Dena Johnson-Schlitz (front)

UW Genetics Professor **Bill Engels** was awarded a 2008 Kellet Professorship in recognition of a distinguished career devoted to understanding mobile genetic elements and DNA repair. His P-element studies of the 1980's and 1990's elucidated mechanisms by which transposable elements mobilize, work for which he is well known among fly geneticists and evolutionary biologists. Bill also invented methods for using P-elements as a "tagged mutagen" in genetic screens; the resulting ability to mobilize P-elements at will drastically improved the efficiency of gene discovery from forward genetic screens, revolutionizing *Drosophila* research in much the same way mouse knockout technology has boosted mammalian genetics. During the last ten years, Bill's discoveries concerning the mechanics of P-element transposition shifted his attention to mechanisms employed by cells to repair double-stranded breaks in DNA. P-elements transpose by a cut-and-paste mechanism in which excised P-elements are restored by repair of double-stranded breaks

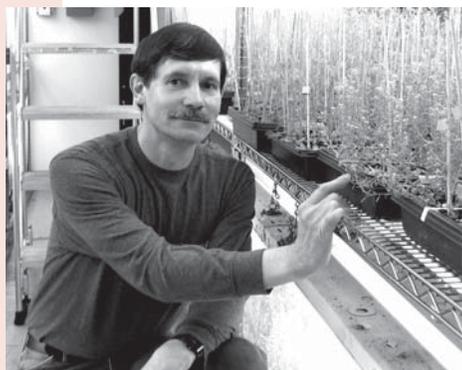
using a sister chromatid as template. In extending his work to the unraveling of DNA repair mechanisms Bill has developed elegant quantitative methods for distinguishing among competing double-stranded break repair mechanisms. His novel assays are able to detect the products of specific repair pathways in both the soma and germline in the natural context of the whole organism. Recently, Bill and co-workers have identified age-dependent shifts in the programs used for DNA repair, a finding that has implications for understanding cancer risks associated with aging. ■

Genetics Professor Sean Carroll's Books Adapted for NOVA Special on Evolution

This spring the PBS television series NOVA will air a two-hour special on evolution based on *Endless Forms Most Beautiful* and *The Making of the Fittest*, two popular books authored by UW Genetics Professor **Sean Carroll**. The show, for which Sean is serving as the consulting scientific producer, marks the 150th anniversary of the publication of Darwin's *The Origin of Species* and the 200th anniversary of Darwin's birth. Sean also has two new books, *Into the Jungle* (Pearson, 2009) and *Remarkable Creatures* (Houghton Mifflin Harcourt, 2009). The editors of *Nature* recently named a Carroll lab study as one of 15 "evolutionary gems" (<http://www.nature.com/nature/newspdf/evolutiongems.pdf>). Carroll is a recently elected member of the National Academy of Sciences. During 2008 he was also inducted as a Fellow of the St. Petersburg Society of Naturalists and of the Wisconsin Academy of Sciences, Arts and Letters. ■



Professor Patrick Masson elected to Belgian Royal Academy of Sciences, Letters, and Arts



Genetics faculty member **Patrick Masson** was elected an Associate of the Belgian Royal Academy, the Belgian equivalent of election to the US National Academy of Sciences. Patrick is a Belgian citizen who has maintained strong ties to the European research community. He was recognized for his important contributions to molecular genetics, genomics, and plant genetics. He uses *Arabidopsis thaliana* to understand molecular and cellular mechanisms of root growth in response to gravity and touch. ■

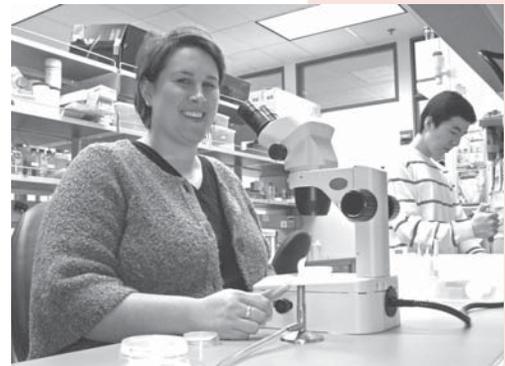
Pound Research Award to Professor Tomas Prolla Highlights Breakthroughs in Aging Research

Professor **Tomas Prolla** was recipient of 2008 CALS Pound Research award in recognition of his pioneering use of microarray technology to characterize gene expression profiles associated with aging. Tom's introduction of this technology catapulted aging research into a new, molecular era by providing the first collection of well-documented aging biomarkers. Tom and co-workers demonstrated aging-related changes in the activity of specific processes such as inflammation and responses to oxidative stress and protein unfolding. Importantly, they also used expression profiling to show that caloric restriction retards aging at the level of molecular biomarkers, a discovery that has dramatically increased interest in this striking but poorly understood phenomenon. The Prolla lab also used their biomarkers set to screen antioxidant food supplements for effects on aging of various tissues, including heart and brain. In recent work Tom and his colleagues created a novel mouse line containing an engineered "mutator" DNA polymerase that elevates the mutation rate for mitochondrial DNA, causing a dramatic acceleration in aging that is correlated with increased apoptosis in several tissues. ■



Seeking Diversity

Assistant Professor **Ahna Skop** has worked to increase minority awareness of our degree programs in genetics through outreach at events such as the Annual Biomedical Research Conference for Minority Students. Ahna recently added a new Diversity Initiative section to our departmental website, featuring student profiles, fellowship information and helpful links to a variety of other diversity-related resources (<http://uwgeneticsdiversity.weebly.com/index.html>). Professor Skop has been appointed to the Wisconsin Task Force on Arts and Creativity in Education, and recently was profiled in *Science* (Remarkable Women in Science, Feb. 2008), *The Sciences* (Balancing Life and Science, Jan. 5th, 2009) and *InBusiness* magazine (40 under 40 Award, 2008). ■



Ahna Skop with her PhD student Erkang Ai.

Graduate Student Awards

The following current PhD graduate students received prestigious fellowships in 2008: **Eric Domyan**, in Xin Sun's lab, received an NSF Fellowship and is studying the genetic interactions among signaling molecules in regulating the differentiation of pulmonary smooth muscle cells. **Beth Dumont**, in Bret Payseur's lab, received an NSF Fellowship and is using genomic resources to study the evolution of meiotic recombination in mammals. **Talline Martin**, in David Baum's lab, is studying the phylogenetic relationships among gene family members for structural genes involved in anthocyanin biosynthetic pathway in *Clarkia gracilis* and received two awards: an AOF Fellowship and the Marie Kristin Kohler Fellowship. **Caroline Neal**, just defended her thesis on root gravitropism in *Arabidopsis* in Patrick Masson's lab and received an AOF Fellowship. Caroline has just started a post-doc with the Center for Disease Control in Atlanta, GA. **Bharti Solanki** received both an AOF Fellowship and the Ruth L. Kirschstein Minority Fellowship and is studying cytokinesis and RNA segregation in zebrafish with Francisco Pelegri. **Robb Stankey** received the Herbold Foundation Fellowship and is characterizing mutant phytochromes with different light qualities in plants in Rick Vierstra's lab. ■

PhD program welcomes first year class



First year class: rear row (l-r) Zak Lemmon, John Herriges; middle row (l-r) Sara Worzella, Claire Chung, Yunsik Kang, Nick Gladman; front row (l-r) Ali Soukup, Emily Cunningham.

Shou Chee (Claire) Chung (Cornell University) has joined Audrey Gasch's yeast genomics lab. **Emily Cunningham** (Truman State University) has joined David Baum's lab and is determining the rate of evolutionary change in genes important in floral symmetry within the Brassicales order. **Nicholas Gladman** (Wittenberg University) is characterizing subunits in the regulatory particle of the 26S proteasome in *Arabidopsis thaliana* in Rick Vierstra's lab. **John Herriges** (Iowa State University) has joined Xin Sun's developmental genetics lab and is looking at the role certain transcription factors play in embryonic lung development. **Yunsik Kang** (University of Wisconsin – Madison) is studying steroid triggered program cell death as a model to understand how cells or tissues respond to global signals in Arash Bashirullah's lab. **Zachary Lemmon** (University of Notre Dame) has joined John Doebley's lab and is fine mapping the effect of a candidate gene and QTL on several maize domestication traits. **Alexander Soukup** (University of Wisconsin-

sin-Madison) has joined Nancy Keller's plant pathology lab is working on how the RNA interference machinery influences heterochromatin formation in *Aspergillus nidulans*. **Sara Worzella** (University of Wisconsin-Madison) is studying Type II Diabetes in Alan Attie's lab, profiling miRNA expression in islets. ■

Two Former UW Genetics Trainees Receive 2008 MacArthur Awards

Prestigious MacArthur Fellowships were recently awarded to former UW Genetics graduate student **Kirsten Bombliies** (PhD 2004, UW Genetics), and to **Susan Mango**, a Professor at the University of Utah who trained as a postdoctoral fellow with UW Biochemistry and Medical Genetics Professor Judith Kimble. Dr. Bombliies was chosen for her discovery of an "autoimmune" response in plants. As a postdoctoral fellow in the laboratory of Delf Weigel at the Max Planck Institute, Kirsten found a pattern of reduced fitness among progeny that she traced to genes responsible for resistance to plant pathogens. This unexpected finding has broad agricultural implications but Kirsten's interest is primarily in how it may contribute to speciation, a question she will continue to investigate as an Assistant Professor at Harvard. Kirsten's interest in plant evolution developed during her graduate training here in Madison with Genetics faculty member John Doebley. Dr. Mango has used genetics to unravel developmental mechanisms that coordinate organogenesis. Using the nematode *C. elegans* as a model systems, her studies have revealed how a single gene, *pha-4*, plays a central role in organizing development of the pharynx. MacArthur Fellowships provide \$500,000 of unrestricted support over a period of five years, and are often referred to as "genius awards" because of the emphasis on self-directed, paradigm-shifting creativity. More information about these MacArthur awards can be found at http://www.macfound.org/site/c.lkLXJ8MQKrH/b.4536877/k.1412/Meet_the_2008_Fellows.htm. ■

Jean Petersen Recognized by Excellence in Service Award



A 2008 CALS Academic Staff Award for Excellence in Service, was awarded to **Jean Petersen**, Senior Student Services Coordinator for the Genetics Department. Jean excels at everything she does – from advising undergraduate students, to organizing our prospective graduate student weekends to overseeing our Genetics Retreat. As an advisor, Jean draws on more than twenty years of experience in genetics research. She has advanced our teaching mission by organizing a teaching assistant training course for our graduate students. Jean was instrumental in creating the Undergraduate Genetics Association and continues to serve as advisor to this group. Jean has served on the CALS Diversity Committee, the Outstanding Students Committee, the Steenbock Library Committee, and the CALS Leadership Certificate Committee. Since 2001 she has been involved in organizing the Life Sciences Career Fair and Resume and Networking Workshops. During her ten years as Student Services Coordinator, Jean has worked tirelessly to provide a welcoming and beneficial academic home for our students. ■

A Special Day

She claims no connection, but veteran Laboratory of Genetics financial specialist Lois Day decided to retire last fall after quarterback Brett Favre departed Green Bay. A huge Packers fan, Lois's office was a veritable shrine of Green and Gold memorabilia. Her office was a favorite stop for all – visiting or resident – especially the old-timers who felt the urge to reminisce about the good old days. Lois was in the habit of staying late and could often be found still at her desk until 9 or later in the evening. Lois's attention to detail was legendary and no doubt kept a series of department chairs out of trouble. In the years before electronic grant submissions those of us in need of last minute help meeting a deadline could count on Lois to get us through the crisis. Congratulations and well deserved thanks to Lois Day for her many (44!) years of dedicated service to the department. ■

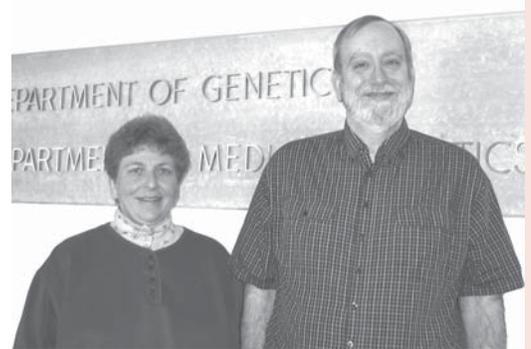


Phil Anderson presented Lois Day a football signed by another famous Wisconsin retiree, Brett Favre, at her retirement party.

Genetics Welcomes Office Staff Members

Beth Rettenmund, Financial Specialist, joined the Genetics office staff in September of 2008. Beth has worked for the State of Wisconsin for 21 years, the majority of which were worked here on campus. She has been with CALS since 2003. Beth performs grant accounting and related financial responsibilities for the Laboratory of Genetics. A lifelong resident of Wisconsin, Beth lives on her family farm in rural Dane County.

Robert Moldenhauer, Information Processing Consultant, joined Genetics in October of 2007. Robert has worked most of his life in the public sector: the City of Madison (2 years), US Geological Survey (8 years), Wisconsin Department of Natural Resources (8 years) and the (Australian) Wingicarribee Shire Council (5 years). Robert is a graduate of the UW Department of Computer Science. Robert provides computer services and support for Genetics faculty and staff and maintains the department network, servers, databases and websites. Robert was born in Wisconsin, is an American/Australian dual citizen and an avid Cricket fan. He lives in Middleton but dreams of living near a warm beach someday. ■



Madison Success Stories in Biotechnology

Madison-based Mirus Bio Corporation, co-founded in 1995 by Pediatrics and Medical Genetics Professor **Jon Wolff**, was acquired by Swiss pharmaceutical giant Roche according to an announcement made in July 2008. Jon specializes in the development of methods and reagents for transfer of DNA and RNA into mammalian cells, and was the first to demonstrate the ability of mammalian tissue to take up and stably incorporate pure recombinant DNA. Under the agreement, Roche will maintain an RNAi research center in Madison and the Mirus commercial transfection reagent business will operate as privately-held MirusBio LLC, which will continue to be located in Madison. Jon recently left his position at the UW to become the President of MirusBio LLC.

The Mirus news follows Roche's acquisition of Madison-based NimbleGen in 2007. NimbleGen uses maskless array synthesizer technology co-invented by Genetics Professor **Fred Blattner**, to make custom DNA microarrays for use in medical diagnostics and research. Fred also founded two other companies, DNAStar, which provides software for DNA sequence analysis, and Scarab Genomics, which markets Clean Genome *E. coli* for use as a recombinant DNA host in research and pharmaceuticals. ■



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Laboratory of Genetics
425-G Henry Mall
Madison, WI 53706-1580

Tel: 608-262-1069
Fax: 608-262-2976

Centennial Celebration: 100 years of Genetics at UW

2010 will mark the 100th anniversary of the founding of the Department of Genetics in the UW College of Agricultural and Life Sciences (CAL S) and the 50th anniversary of the founding of the Department of Medical Genetics in the UW School of Medicine and Public Health (SMPH).

Founded in 1910, CAL S Genetics, initially the Department of Experimental Breeding, adopted its current name in 1918, and is the oldest of its kind in this country. Shortly after SMPH Medical Genetics was founded in 1960, the two departments were administratively merged into a single structure of governance with a single department chair. The same structure is still in place today and is referred to by the umbrella name, the Laboratory of Genetics. A centennial celebration May 20-22, 2010, will include the annual Oliver Smithies Symposium and a special Symposium: "100 Years of Genetics – What's Next?", featuring Madison's research contributions in Agricultural Genetics, Evolution, Medicine and Neuroscience. The 3-day event will conclude with a Centennial and Golden Jubilee Banquet. Visit our UW Genetics Centennial website to learn more and to share your memories of your days in Madison: <http://centennial.genetics.wisc.edu>.



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[HTTP://WWW.GENETICS.WISC.EDU](http://www.genetics.wisc.edu)