LETTER FROM THE DEAN

Dear Friends of NSM,

As the 2010-2011 academic year draws to a close, I welcome you to read our latest issue of The Continuum. In this issue we highlight some of the ways that our faculty and students have been involved with the DU community, as well as how we have reached out to the Denver area and beyond.

This spring, our own Todd Blankenship participated in TEDx at DU to speak about his work in developmental biology. The Molecular and Cellular Biophysics committee hosted the first annual DU Biophysics Symposium, an event that attracted more than one hundred participants. We are pleased to report that we were able to bring one of our many distinguished alumni, Dr. Nick Benedict, back to campus for the DU Masters Program this year. Finally, we have highlighted one of our most promising students, DiDi Wei, and her prestigious Goldwater Scholarship award.

If you are ever in the DU neighborhood, please stop by and say hello. We are always happy to see a familiar face and to find new ways to engage with alumni.

Have a wonderful summer,

L. Alayne Parson
Dean, Division of Natural Sciences and Mathematics
When he takes the stage at TEDxDU in May, University of Denver professor Scott Blankenship will talk about one of the “big questions” in life: Why do we look like we do?
More precisely, how do humans and animals emerge from a single, mostly round cell into the shapes that we take? How do we emerge, “programmed” cells line up in the correct places to make us look like humans, or dogs, or fruit flies?

“If you look at a human being, every human has a very stereotypical shape,” Blankenship says. “We’ve got a head up at one end, feet at the other end. We’ve got two limbs up top, two limbs at the other end.”

To study these fundamental mysteries of life, Blankenship and his students use a high-speed powerful microscope that peers into developing fruit fly embryos and photographs the cells as they scurry into position. They actually watch cells as they arrange themselves. Cells destined to be part of the head migrate to one end. Cells tagged for tail duty migrate to the other.

“If you look at almost any higher animal, we’re elongated along one axis. We’re elongated from head to toe, that’s our long axis. That poses a really interesting question, because we almost always start out as a sphere of cells, and then somehow along the line that sphere has to turn into something that’s long along one axis,” Blankenship says. “This is something that almost every higher animal is going to have to do.”

To study this cellular choreography — known as cell polarization — Blankenship and his students manage a massive hive of fruit flies. Not the evil, disease spreading variety, but a benign breed that peacefully eats corn mush and lays eggs. Their rapid life cycle, springing from egg to fly in about 8 days, means researchers have a steady supply of embryos to put under the spinning disk confocal microscope. Students prep the building blocks by fusing DNA from jellyfish to the flies, tagging proteins with material from the jellyfish that will glow when “excited” by laser light. Then the embryos pupa are placed on the microscope and subjected to laser light. Scientists can then identify and photograph specifically tagged cells as they move about, changing what was once a tiny grub into a fly.

“There are molecules that tell a cell ‘you’re going to be at the head of the fly’, and molecules that tell a cell ‘you’re going to be at the end of the fly.’” Blankenship says. “What we’re looking at is one level down to see once how once you receive those instructions, the body tells the cells. If you’re going to be the head, we have to move all these cells up here, and if you’re going to be the tail we have to move you down here. That’s the huge black box that developmental biologists do not know, and that’s what we’re trying figure out.”

Blankenship says the beauty of his lab’s work is that it’s never done, and it’s purely basic research, driven by the desire to understand how things work. Just learning how cells do what they do can open doors to understanding how similar events go wrong in the development of human cancers and other cell malfunctions, but Blankenship’s team focuses simply on understanding the underlying rules of cell behavior.

“All your work leads to many more questions,” he says. “At some point maybe we’ll know the atomic behavior of every protein that’s involved and we’ll say we’re done. But I think we’re going to be in business for a long time.”

The CCHF virus is considered a dangerous emerging disease by the CDC and has fatality rates as high as 70%. Originally identified in the Congo by a member of the former Soviet Union, the virus has rapidly spread throughout Africa, Asia, and Europe. More recently CCHF has become a topic of interest to researchers in the United States due to the 2009 death of a U.S. soldier stationed in Afghanistan. The more particular symptoms of CCHF in humans include fever, prostration, and severe hemorrhages. To date there is no FDA approved vaccine or drug available to treat the CCHF virus.

Scientists at DU were highlighted in the April issue of the Journal of Virology for presenting the first atomic level protein structure to be solved at the University of Denver. A team of researchers headed by Scott D. Pegan, Ph.D., was able to determine the three-dimensional structure of a viral protein from the Crimean-Congo Hemorrhagic Fever, more commonly called CCHF. The structure of this protein was obtained using an X-ray scattering technique known as X-ray crystallography. More importantly, the viral CCHF protein was solved when bound to its human target. This specific protein from CCHF has also been found to play a key role in the virus’ ability to evade the human immune system.

The next step, said Pegan, is to translate our structural understanding of this specific viral protein into drug development, targeting the necessary raw data needed to reveal the first ever three-dimensional structure of this type of viral protein here at the University of Denver.

When not in the lab, Pegan is an accomplished sculptor and teaches at DU. Pegan currently has cryogenically frozen protein crystals at the Oak Ridge National Laboratory’s High Flux Beam Reactor, which can help determine the structure of the CCHF viral protein as well as the human protein by cloning the protein into bacteria. Pegan is a member of the Molecular and Cellular Biophysics Doctoral Program inaugural class and is currently working with students to determine the atomic structure of the human protein.

Capodagli is a member of the Molecular and Cellular Biophysics Doctoral Program inaugural class. Capodagli’s research involves yeast, another DU undergraduate who is working on a Tuberculosis-related project, and Capodagli was able to mount the frozen crystals and collect the necessary raw data needed to reveal the first ever three-dimensional structure of this type of viral protein here at the University of Denver.

The next step, said Pegan, is to translate our structural understanding of this specific viral protein into drug development, targeting this key protein in particular and with the hope that the results may provide a feasible treatment for the CCHF virus.

Source: CNN.com gets nearly 22 million unique visitors every month. The article can be seen at [CNN.com](http://www.cnn.com).

CheMinistry Professor Don SteDMan Interviewed by CNN

A popular science TV series on Japan’s NHK network equivalent to NOVA on PBS. The symposium, were pleasantly surprised with the wonderful array of Colorado biophysicists, and the opportunity to interact informally between talks and at the lunch and poster session. I certainly hope that this symposium can be continued, and perhaps expanded to focus also on graduate students as the MCB program matures.

The symposium brought together scientists from several different institutions and many different academic departments and programs such as Pharmacological Sciences, Chemistry & Biochemistry, Physics & Astronomy, Biomedical Engineering, Structural Biology, Molecular Genetics, Molecular, Cellular and Developmental Biology, and Neuroscience. The keynote speakers were Jon Vale, Professor of Anatomy and Professor of Cell and Molecular Physiology at the University of California, San Francisco, and Carlos Bustamante, Professor of Molecular and Cell Biology, Physics and Chemistry at the University of California, Berkeley. The regional speakers included: Mark Church, Department of Pharmacology, University of Colorado Denver; Robert Hedges, Biochemistry & Molecular Genetics, University of Colorado Denver; Kurt Bean, Department of Physiology & Biophysics, University of Colorado Denver; Dick McDuff, Molecular Cell and Developmental Biology, University of Colorado Boulder; Michael Tamkin, Department of Biomedical Sciences, Colorado State University; Diego Kafri, Department of Electrical & Computer Engineering, School of Biomedical Engineering, Colorado State University.

Based on the attendance and feedback they have received, it is likely that the symposium will be offered again next year. For more information on the new MCB Doctoral program, please visit our website [www.du.edu/nsm/alumni/givetonsm.html](http://www.du.edu/nsm/alumni/givetonsm.html).

Astronomy Professor Toshiya Ueta Featured on Japanese TV

Dr. Toshiya Ueta was the focus of the November 20, 2010, episode of Science Zero, a popular science TV series on Japan’s NHK network equivalent to NOVA on PBS. The program highlighted Dr. Ueta’s research using infrared space observations to image the complex dust structures that surround ancient red giant stars.

Chemistry Professor Don Stedman Interviewed by CNN

In April, Dr. Don Stedman spoke to CNN about the use ethanol as a major fuel source. CNN.com gets nearly 22 million unique visitors every month. The article can be found at [http://www.cnn.com](http://www.cnn.com).

Physics Today Highlights Work of Aaron Goldman

Work by Professor Termanos and John Evans, Professor of Biochemistry and colleagues was prominently cited in a feature article of the January 2011 issue of Physics Today, the primary publication of the American Institute of Physics. Research presented in the article entitled “Infrared Radiation and Planetary Temperature” was made use of the TETAN database of infrared spectral line parameters compiled by a team including Dr. Goldman and used in applications across engineering and atmospheric sciences.

American Astronomical Society Invites Stencil, Kloppenberg to National Meeting

Wormhole Professor Robert Stenzen and graduate student Brian Kloppenberg gave invited talks about their research at a special session during the American Astronomical Society national meeting in Seattle, WA in January. Their research involves infrared and interferometric studies of the unusual star epsilon Aurigae.

Darbinson Reacts to Rapid DNA Testing Possibility on Bin Laden

Local news station CBS4 interviewed Phil Darbinson, Professor of Biological Sciences, about the DNA testing of al Qaeda leader Osama bin Laden. The article can be seen at [http://denver.cbslocal.com](http://denver.cbslocal.com).

Nsm hosts Molecular and Cellular Biophysics Symposium

The University of Denver hosted the inaugural symposium on Molecular and Cellular Biophysics this spring. The symposium marks the beginning of the newly launched doctoral program in Molecular and Cellular Biophysics (MCB) in the Division of Natural Sciences and Mathematics. The program combines facilities from the departments of Biological Sciences, Chemistry & Biochemistry, and Physics & Astronomy.

The inaugural symposium was a one-day meeting that included two keynote speakers, six talks from regional speakers, and a poster presentation session featuring 35 poster abstracts. It attracted 138 participants including faculty, postdoctoral researchers, graduate and undergraduate students, and staff from several regional institutions including DU, the University of Colorado at Boulder and at Denver, Colorado State University, the University of Wyoming, Montana State University, and the National Renewable Energy Laboratory. Nancy Lenehan and Kings Ghosh, co-chairs of the symposium, were pleasantly surprised with the turnout, Lenehan comments, “this is the first regional biophysics meeting in the area of that we are aware. We received a lot of positive feedback about the symposium, and many of the participants are asking that the symposium be offered on an annual basis.” One of the symposium attendees, Jefferson Knight, Assistant Professor of Chemistry at the University of Colorado at Denver, wrote, “I really enjoyed seeing the talented keynote lecturers, the wonderful array of Colorado biophysicists, and the opportunity to interact informally between talks and at the lunch and poster session. I certainly hope that this symposium can be continued, and perhaps expanded to focus also on graduate students as the MCB program matures.”

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BIOLOGY AND ENVIRONMENTAL SCIENCES ALUM RECEIVES MASTER SCHOLAR AWARD

Dr. Nicolas Benedict was honored by DU as one of 17 outstanding alumni from various academic units at the annual Masters Program Awards Dinner on Monday, April 4th. The Masters Program is an annual event that recognizes alumni from all academic units who are distinguished professionals in their fields. The Program serves as a way to connect alumni directly with current DU students. Successful alumni professionals are selected by academic units to be “Master scholars.” The alumni are then invited to participate in lectures or teach courses during a regular day in the academic schedule. Through direct contact with faculty and student groups, alumni can share their expertise and insights on various career fields. The Masters Program also allows students to learn about the different ways a DU education can be applied in the years after college.

Dr. Benedict is an accomplished biologist whose academic areas of expertise include environmental science, conservation genetics and molecular biology. He earned a BA in Environmental Science at DU in 1993, followed by a PhD in Biology in 2001. Much of his original research focused on the development and use of novel molecular tools to address taxonomic and population level uncertainties which were fundamental to developing sound wildlife conservation and management strategies. Many of these necessitated the development of complex research collaborations among multiple federal, state, non-governmental agencies and organizations, as well as within the private sector.

Dr. Benedict has an extensive background in education ranging from the University to Elementary school levels. He is now the President and CEO of eScience Labs, a local company that produces an array of at-home educational lab kits. With a unique blend of hands-on activities and online content, these kits provide interactive, safe and complete experimentation tools for the modern student at the middle school, high school and introductory college level.

Math and Physics major Didi Wei was recently awarded a Goldwater Scholarship by the Barry M. Goldwater Scholarship and Excellence in Education Foundation. The Program was established by Congress in 1986 to honor Senator Barry M. Goldwater, who served his country for 56 years as a soldier and statesman, including 35 years of service in the U.S. Senate. The Scholarship covers educational expenses for sophomores and juniors who intend to pursue careers in mathematics, the natural sciences, or engineering. The Goldwater Foundation seeks students in mathematics or the sciences who display intellectual curiosity and intensity, and who possess potential for significant future contributions in their chosen field. Each scholarship covers eligible expenses for tuition, fees, books, and room and board, up to a maximum of $7,500 per year. Most of the 2011 winners were in science-related fields, with only 26 mathematics majors, 52 engineering majors and 5 computer science majors in the pool of selected recipients. According to the scholarship’s website, a Colorado native, Ms. Wei was drawn to the University of Denver by its reputation for top-quality academics and study abroad opportunities. Although she is studying abroad in the UK this year, Wei was able to touch base with us via email. She writes, “From a student perspective, the math and science departments at DU allow for a great deal of freedom and flexibility in choosing what we want to learn, while still giving us a solid foundation in the essentials. For instance, I’ve been able to study abroad for a full year and take interesting math and physics classes that will count towards my degree at DU.”

When she returns this fall, Wei intends to continue working as an undergraduate research assistant in the Department of Physics and Astronomy. Since her sophomore year, the Neil has conducted research in the experimental condensed matter lab under the guidance of Professor Barry Zink.

In response to winning the award, Wei writes, “I was happily surprised to receive the award and am certainly grateful for the honor.” After she graduates next year, Wei plans to pursue a doctoral degree to continue her research. Aside from her studies, Wei enjoys participating in the Student Physics Society, Ultimate Frisbee, and Panners for Public Health.

Dean Alynne Parsons with NSM Master Scholar Nick Benedict. Photo by Wayne Armstrong

STUDENT HIGHLIGHT: GOLDEN OPPORTUNITY FOR MATH AND PHYSICS MAJOR

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According to a press release by the Goldwater Program, the Foundation awarded 275 scholarships for the 2011-2012 academic year. Goldwater Scholars were selected on the basis of academic merit from a pool of 1,095 students nominated by the faculties 412 colleges and universities across the nation. The one- and two-year scholarships cover the cost of tuition, fees, books and room and board up to a maximum of $7,500 per year. Most of the 2011 winners were in science-related fields, with only 34 mathematics majors, 52 engineering majors and 5 computer science majors in the pool of selected recipients, according to the scholarship’s website. A Colorado native, Ms. Wei was drawn to the University of Denver by its reputation for top-quality academics and study abroad opportunities. Although she is studying abroad in the UK this year, Wei was able to touch base with us via email. She writes, “From a student perspective, the math and science departments at DU allow for a great deal of freedom and flexibility in choosing what we want to learn, while still giving us a solid foundation in the essentials. For instance, I’ve been able to study abroad for a full year and take interesting math and physics classes that will count towards my degree at DU.”

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