BIODESIGN BRIEFS

Deirdre Meldrum, PhD, new dean of the Fulton School of Engineering and director of the Institute's Center for EcoGenomics, was awarded $18 million for a NIH Center of Excellence in Genomic Science.

The Biodesign Institute participated in a statewide initiative that secured an NIH planning grant to increase patient access to new medical breakthroughs.

Frederic Zenhausern, PhD, director, Center for Applied NanoBioscience, secured $720,000 from the UK Forensic Science Services to assess DNA forensic technology.

Charles Arntzen, PhD, co-director, Center for Infectious Diseases and Vaccinology, was awarded the Centennial Award for Plant Research from the Botanical Society of America.

Guy Cardineau, PhD, Center for Infectious Diseases and Vaccinology, was awarded $100,000 for a collaboration with Tecnológico de Monterrey to study plant-based vaccine technology.

Marc Porter, PhD, was appointed director of the Institute's new Center for Combinatorial Sciences.

Jieping Ye, PhD, Center for Evolutionary Functional Genomics, was awarded $583,000 from the NSF for image analysis of biological data.

Randall Nelson, PhD, was recruited to lead the Molecular Biosignatures Analysis Unit.

Michael Rosenberg, PhD, Center for Evolutionary Functional Genomics, was awarded $642,000 by the NSF for spatial analysis of biological and genomic data.

Ranu Jung, PhD, co-director, Center for Adaptive Neural Systems, was elected president of the Organization for Computational Neuroscience.

Shelley Haydel, PhD, Center for Infectious Disease and Vaccinology, was awarded $439,000 to study a clay mineral alternative treatment for Buruli ulcer.

Stuart Lindsay, PhD, director, Center for Single Molecule Biophysics, was awarded $1.1 million from the NSF to build molecular devices for solar energy and $550,000 from the NIH to make nanoscale arrays for diagnostic purposes.

Sudhir Kumar, PhD, director, Center for Evolutionary Functional Genomics, was named an ASU 2006 Promotion and Tenure Exemplar. He also received $1.03 million from the NSF to explore how nutrients affect proteins and establish a database resource.

Abbreviations: NIH - National Institutes of Health; NSF - National Science Foundation

SUMMARY OF NEW AWARDS

$18 MILLION
FOR NIH CENTER OF EXCELLENCE IN GENOMIC SCIENCE

$720,000
TO ASSESS DNA FORENSIC TECHNOLOGY

$100,000
FOR A COLLABORATION WITH TECNOLÓGICO DE MONTERREY TO STUDY PLANT-BASED VACCINE TECHNOLOGY

$583,000
FOR IMAGE ANAYLSIS OF BIOLOGICAL DATA

$642,000
FOR SPATIAL ANALYSIS OF BIOLOGICAL AND GENOMIC DATA

$439,000
TO STUDY A CLAY MINERAL ALTERNATIVE TREATMENT FOR BURULI ULCER

$1.1 MILLION
TO BUILD MOLECULAR DEVICES FOR SOLAR ENERGY

$550,000
TO MAKE NANOSCALE ARRAYS FOR DIAGNOSTIC PURPOSES

$1.03 MILLION
TO EXPLORE HOW NUTRIENTS AFFECT PROTEINS AND ESTABLISH A DATABASE RESOURCE

Velocity is a quarterly newsletter of the Biodesign Institute at Arizona State University.

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WIN AN iPod NANO!

Complete our online survey before March 1 and earn the chance to win an iPod nano. The device holds up to 2,000 songs and 25,000 photos. The winner will receive the special edition (PRODUCT) RED™ version, for which Apple contributes $10 per sale to the Global Fund to fight AIDS in Africa. Go to: http://surveys.biodesign.asu.edu/velocity

WANT MORE BIODESIGN NEWS?

Monthly updates from the Biodesign Institute at ASU can be sent directly to your inbox by signing up for our free monthly e-newsletter. Register at www.biodesign.asu.edu/news/monthly.

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THE biodesign INSTITUTE
ARIZONA STATE UNIVERSITY

student opportunities

The Biodesign Institute fuses diverse scientific disciplines to accelerate discoveries. Our student training opportunities are aimed at preparing students to excel in the science fields of the future.

GRADUATE TRAINING
Our dynamic, interdisciplinary research environment that prepares graduate students equally well for research roles in an academic environment or in private industry. Among the signature benefits that distinguish us are:

- An interdisciplinary training program that includes rotation through multiple research centers.
- A new facility that is equipped with the latest in lab instrumentation and technologies.
- A culture of entrepreneurial research that allows tremendous opportunity for creative thinkers. Big ideas are encouraged, and Institute faculty and leaders have proven experience in translational research.

If you are interested in our graduate training, please contact Student Initiatives Coordinator Maria Hanlin, (480) 727-9577.

UNDERGRADUATE PROGRAMS
Interested undergraduate students should contact a Biodesign Institute faculty member directly to learn about available positions. See the faculty directory in the "People" section of our Web site.

HIGH SCHOOL PROGRAM
The Institute's high school summer internship program offers those age 16 and older hands-on experience in bioscience research. These paid internships are offered in an eight-week program in June and July. Students work an average of 20 hours per week in laboratories assisting with research projects. Applications for the 2007 summer session will be available on our Web site in February.

ISSUE NO. 1 | WINTER | 2007

INSIDE THIS ISSUE:

BIODESIGN
Velocity

Quarterly news from the Biodesign Institute at Arizona State University

THE biodesign INSTITUTE
ARIZONA STATE UNIVERSITY

ACCELERATING VACCINE PROJECTS

Team Targets HIV, Smallpox and Other Diseases

Bert Jacobs uses one virus, vaccinia, to fight another: the HIV/AIDS worldwide pandemic.

Biodesign Institute virologist Bert Jacobs, PhD, is a pioneer in creating and improving vaccines using a poxvirus called vaccinia. His success in advancing science with a clear societal impact recently earned him the honor of 2006 Innovator of the Year for Academia at the Arizona Governor's Celebration of Innovation.

Jacobs has secured more than $3 million in research funding for projects that include producing a safer smallpox vaccine as well as a post-exposure smallpox vaccine. In his latest project, his team is taking on the daunting worldwide pandemic of AIDS.

Jacobs is strongly motivated by first-hand experience in seeing the devastation caused by HIV. His interest began five years ago when he attended the international AIDS conference in Durban, Africa.

"That's when I got my first idea of what the AIDS epidemic was really like in Africa," said Jacobs. Sub-Saharan Africa represents the area most severely impacted by the AIDS epidemic, with 25.8 million of the world's estimated 40 million cases of HIV.

"After that, I made a commitment that we would try to use our technology to fight the epidemic."

In partnership with Switzerland's Centre Hospitalier Universitaire Vaudois, Jacob's team is part of a $15.3 million international effort funded by the Bill and Malinda Gates Foundation to advance the most promising new poxvirus vaccine candidate into Phase I clinical trials.

"We hope we are the ones to find the solution, but the most important thing is that someone finds it soon," he said.

IMAGINE A WORLD WHERE...

Nanoscale devices diagnose disease before symptoms appear

Treatment is matched to a patient's unique genetic makeup, reducing dangerous side effects

Safer, more cost-effective vaccines are available

Alternative fuels that mimic natural photosynthetic processes replace fossil fuels

Genetically-modified bacteria create energy from waste

Early warning systems detect infectious diseases and bioterrorism threats

Natural microorganisms can be used to remove chemicals from drinking water

Food-packaging technology warns if food is unsafe to eat

A vaccine can prevent virtually any type of cancer

Implantable devices enable people living with spinal cord injuries and stroke to regain mobility

No child dies for lack of a vaccine

Medicines cure the underlying disease, instead of treating symptoms

WELCOME TO VELOCITY

ve·loc·i·ty (vəläs'ətē) **n.**, pl. -ties
1 a quantity that specifies both the speed of a body and its direction of motion
2 quickness of motion: **SPEED**
3 rapidity of action: **URGENCY**

Less than five years ago, ASU's then newly appointed president, Michael Crow, outlined a bold new approach to transform ASU into a world-class research university. A mere two and a half years after he launched this strategic plan ("A New American University"), 200 individuals — faculty, students and support staff — moved into the first wing of the Biodesign Institute.

Today, with a $60 million operating budget, a 600-person team and 350,000 square feet of interdisciplinary research space that rivals the best found on any campus in the nation, the Biodesign Institute is on a fast track in every aspect of its operations. From faculty and student recruitment to research funding and collaborations with diverse partners, the Institute is working with maximum velocity to achieve our goals. This includes discoveries to improve human health and quality of life, while educating highly talented students to engage with complex, global problems.

"Velocity," which is speed in a given direction, reflects our recognition that solving complex, multidimensional problems requires both speed and a focus on solutions that have impact. While we rapidly are becoming a large entity with literally hundreds of research projects, spanning a broad spectrum of science and technology, our efforts are linked by a strategic plan that drives these projects in a unified direction. We have identified with precision where we are and where we want to be, but — as the pace of science accelerates ever faster — we must ensure that we keep our eyes on the road to success.

I hope that you will find this quarterly publication of our progress informative and inspiring and that you will engage with us to ensure we reach destinations that will benefit both current and future generations.

Wishing you the best in the new year,

George Poste

George Poste, DVM, PhD, DSc, FRS

> "We have identified with precision where we are and where we want to be..."

George Poste
Director, The Biodesign Institute
at Arizona State University
Regents' Professor and
Del E. Webb Distinguished Professor of Biology

DISCOVERY MAY AID NATIONAL SECURITY EFFORTS

Biodesign Institute researcher Joe Wang, DSc, believes in action.

After the thwarted 2006 London airline liquid explosives plot, Wang gave his research group in the Institute's Center for Bioelectronics and Biosensors a challenge: create a way to rapidly detect improvised explosives. In just a few months, they developed a highly-sensitive technology to detect the hydrogen peroxide in these explosives. "This technology can identify liquid explosives in as little as 15 seconds," said Wang.

> "This technology can identify liquid explosives in as little as 15 seconds."
>
> JOE WANG, DIRECTOR,
> CENTER FOR BIOELECTRONICS AND BIOSENSORS

Ironically, it was Wang's experience in designing tiny sensors to monitor glucose levels in diabetics that led to this breakthrough. He has developed enzymatic tests that convert blood glucose to a hydrogen peroxide byproduct that is then measured by an electrochemical sensor.

The team in now working to integrate the explosive detection device into a high-performance, easy-to-use system appropriate for large-scale screening.

GERMS' SPACEFLIGHT PROPELS INFECTIOUS DISEASE RESEARCH

The September launch of the space shuttle Atlantis included some tiny passengers from the Biodesign Institute. They were samples of three common germs that have been identified as potential health threats to flight crew members. Now returned to Earth, Institute scientists have been studying changes in the microbes' genetic responses and in their ability to cause disease.

Astronaut illness has occurred on a high percentage of spaceflights, and NASA is interested in better understanding the reasons. It's possible that changes in common infectious organisms during spaceflight enable them to evade normal immune responses. "Our experiment is the first to investigate the effects of spaceflight on disease-causing microbes," said Cheryl A. Nickerson, PhD, who is leading the study.

Cheryl Nickerson simulates micro-gravity to uncover its effects on disease-causing microbes.

The results of this experiment will help NASA evaluate the risks to astronauts on future missions planned to the moon and Mars. However, Nickerson believes the research also benefits those not planning to engage in space travel. "Spaceflight has been shown to induce key changes in both human and microbial cells that are directly relevant to infectious disease" said Nickerson. She said understanding how these changes enable germs to thwart the immune system may provide key insights into fighting disease processes here on Earth.

SMALL ELECTRONIC DEVICES COULD BE POWERED BY TINY NEW FUEL CELL

Step aside battery acid. A better source of "juice" is in the works. Researchers at the Biodesign Institute have created a tiny hydrogen-gas generator that can be developed into a compact fuel cell package. The fuel cell could power laptop computers, digital cameras or portable music players three to five times longer than conventional batteries of the same size and weight.

The generator uses a special solution containing a compound with an unusually high capacity for storing hydrogen, a key element used by fuel cells to generate electricity. In laboratory studies, prototype devices have provided sustained power to light bulbs, a radio and a DVD player.

"We're trying to maximize usable hydrogen storage capacity to make the fuel cell power source last longer," said project leader Don Gervasio, PhD, who is also an associate professor of chemistry. "That could lead to the most powerful power source ever produced for portable electronics."

The fuel cell system can be packaged in containers of the same size and weight as conventional batteries and is recharged by refilling the fuel cartridge, they say. Research on the battery replacement fuel cells, which also are safer for the environment, was presented by Gervasio at a recent national meeting of the American Chemical Society.

GRADUATE STUDENT HELPS KIDS WITH CEREBRAL PALSY IMPROVE COORDINATION

Oregon native Andrea Downing has always been physically inclined. However, after tearing a ligament in a soccer game, Andrea became fascinated with therapies used to heal her knee.

Now a graduate student in the Biodesign Institute's Center for Adaptive Neural Systems, Downing is currently working to help children with cerebral palsy (CP) improve lower-body coordination, something that is difficult for children with this condition.

"Intervening early to help them walk, run and jump should aid their overall development and ultimate independence," said Downing.

Andrea has spent three years developing a therapy that challenges the children to make coordinated contractions of the muscle groups in the hip, knee and ankle. Standing on a sensing platform, the participants engage in a video game that requires leaning motions. They also solve puzzles by applying the forces that they generate in their leg muscles to a foot pedal.

Downing secured an elite $90,000 Ruth Kirschstein Pre-Doctoral Fellowship Grant from the National Institutes of Health in September 2005. The funding has allowed her to develop measurement tools to more thoroughly analyze the impact of CP therapy.

"Recently, we experienced progress with a little boy who struggled with stumbling and falling," she explained. "His parents were so excited to see the difference in his coordination. It not only motivated me to keep going, it was confirmation that this work can improve the quality of someone's life."

STUDY PARTICIPANTS NEEDED:
The Center for Adaptive Neural Systems is seeking both able-bodied children and children with a CP diagnosis of spastic diplegia to participate in the coordination research study. Children must be age 8-14. Contact andrea.downing@asu.edu for more information.

The center also has other studies currently recruiting for participants who have spinal cord injuries. Individuals interested in information should contact center co-director James Abbas, PhD at (480) 965-9521.

Biodesign graduate student Andrea Downing takes a break from testing her video game therapy created to improve physical coordination in children with cerebral palsy.

ACCELERATING DISCOVERY FROM 0-60

With a current operating budget of $60 million and a rapidly growing, 600-person team, the Biodesign Institute at Arizona State University is on the fast track to success.

Since opening in 2004, the Institute has become a major economic driver for Arizona while advancing discoveries that prevent and cure disease, overcome the limitations of injury, sustain the environment, and support national security.

In FY '06, the Institute:

- Appointed 15 new faculty
- Received five patents and filed 20 new patent applications
- Provided training opportunities for more than 200 students
- Celebrated the acquisition of two Institute spin-off enterprises by multinational bioscience companies
- Saw clinical, industrial and organizational collaborations expand to a total of nearly 250 partnerships
- Completed the second phase of the Biodesign Institute, bringing the Institute's total to 350,000 sq. ft.