SYNERGY

BECKMAN INSTITUTE FOR ADVANCED SCIENCE AND TECHNOLOGY

ISSUE 17 • WINTER 2011

A New Approach to Solving an Old Problem for Wheelchair Users

page 2

Astronomica! imagines and images the Universe for visitors to the Krannert Art Museum.

Page 4

Beckman Alumni Profile: MIT researcher Jeff Grossman is a passionate advocate for interdisciplinary research.

Page 5

Beckman Faculty Profile: Florin Dolcos explores the neural mechanisms underlying emotion-cognition interactions.

Page 7

A NEW APPROACH to solving an old problem for wheelchair users

With arms churning, shoulders lurching, and wrists twisting for the essential grip on the handrim, it's easy to see why manual wheelchair users have high rates of carpal tunnel syndrome and shoulder injuries. Only it's not so easy to see.

Manual wheelchair users can propel their wheels hundreds of rotations just to ambulate along a city block, and sometimes quite rapidly when it comes to, for example, crossing a busy street – a fact that makes measuring those movements difficult. It's a challenge that is being answered by Beckman Institute faculty member Jacob Sosnoff.

Thanks to the Americans with Disabilities Act (ADA) and a societal change in how they are viewed, people in wheelchairs have greater access to buildings, educational opportunities, and many other things life has to offer than they did 20 or even 10 years ago. What they haven't had is science that takes a detailed look at the motion required to propel a manual wheelchair.

Sosnoff is changing that. Last year, he set up an experiment using the motion capture suite at Beckman's Illinois Simulator Laboratory (ISL) to glean information on the repetitive movements of manual wheelchair users in a way that's never been done before.

The motion capture technology is the same as that used to create digital movie characters like Gollum from *Lord of the Rings*. Markers placed at certain points of the body were recorded by the suite's ten cameras that can capture images at thousands of frames per second; the digital information from those points is then turned into a finely detailed graphic representation of a wheelchair user's propulsion motion in the form of hundreds of digital, overlapping ellipses.

"An observer in real time can't see motion irregularities and the reason you can't see them is that it happens only once in maybe a hundred revolutions and involves very subtle variances in motion," ISL director Hank Kaczmarski said. "Our motion capture system is capturing images at a thousand frames a second; researchers can then take the data offline and parse out these subtle differences."

The initial focus of this project was to see if the technology and experimental set-up in the motion capture suite were effective. The answer was yes, and the results included a finding that showed differences in the propulsion patterns of experienced and novice wheelchair users.

Sosnoff, who is an Assistant Professor in the Department of Kinesiology and Community Health at the University of Illinois, collaborated on the wheelchair propulsion study with Elizabeth Hsiao-Wecksler from the Department of Mechanical Science and Engineering. A member of Beckman's Human Perception and Performance group, Sosnoff's research interests include aging, disability, mobility, and perceptual-motor variability.

"Predominately I'm trying to understand how we control our movements, literally how our brain controls our movements," Sosnoff said. "I come from a behavioral standpoint. I look at behaviors to try and understand how we move, and within that I am very interested in motor variability."

Sosnoff said that every time people do a common or repetitive movement, such as writing their name, each time there are slight fluctuations in that movement.

"What I've been looking at most recently is to try and see if those fluctuations in the movement, from fine movements like writing, to more complex movements like wheelchair propulsion, to see if that variability is indicative of some dysfunction," Sosnoff said. "The analogy I like to give, especially for the wheelchair work, is that the amount of variability we see in movement can be related to muscular-skeletal pain. The idea with the study I'm doing at ISL is to see if variability in wheelchair propulsion is related to shoulder pain."

Sosnoff said his current research directions are based on a decision he made a few years ago to focus less on the theoretical and more on work that could translate into helping people.

"I started off from a theoretical motor control sense," Sosnoff said. "It gets to the point where there are probably a dozen people in the world doing the same type of work that I was doing and understood the theoretical application I was doing it in. I sort of got tired taking to myself so I wanted to apply this knowledge, this theoretical training, to a real-world problem."

That decision – along with his personal background and home department setting – naturally led Sosnoff into doing studies on the physical mechanics of wheelchair users. A concern for the struggles people with disabilities face on an everyday is ingrained in Sosnoff, even though he is not disabled and

Ten cameras and sensors gave researchers unprecedented insight into a manual wheelchair user's movements.

more on page 3

chose a career path in academia and research.

"Related to this, my family business growing up was manufacturing artificial limbs and braces so I've always been around people with mobility disabilities," Sosnoff said. "I was around this my whole life and, due to interacting with wheelchair athletes on campus, started doing some reading.

"I realized that no one had looked at variability in wheelchair propulsion, which essentially was the green light. My grandfather likes to tell the story about how he used to carve prosthetics out of wood and now you literally scan the stump and then it gets made somewhere and shipped out. So the technology has changed."

But the issues facing people in wheelchairs haven't changed. Studies have shown that shoulder injuries and carpal tunnel syndrome for manual wheelchair users are common.

"Upwards of 60 to 70 percent of manual wheelchair users develop shoulder pain," Sosnoff said. "For individuals who walk, if we hurt our shoulder, we essentially stop the activity, whether it's swimming, racquetball, whatever, that caused it. If someone is depending on their wheelchair for mobility, they are not fortunate enough to be able to stop that movement."

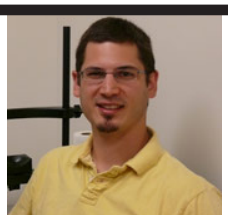
As with any research, the first step is to understand the problem at its most basic element, and doing that required ISL's motion capture technology and movement analysis techniques developed by Hsiao-Wecksler for studying human gait that Sosnoff applied to the wheelchair study.

For the experiment, 23 markers were placed on the arms and upper body of the test subjects, and on the stationary wheelchair, which sat on a roller that allowed test subjects to rotate the wheels. The test subjects, which included those with no experience using a wheelchair and very experienced users, pushed for a couple of minutes on the passive wheelchair and their movements were recorded in order to look at the variability of that repetitive push motion. The researchers also analyzed differences in the experienced and inexperienced groups involving those with and those without shoulder pain.

"The idea is that individuals with pain will have different variability profiles than individuals without pain," Sosnoff said. "Of course that doesn't show causality. We don't know that the change in variability in people with and without pain caused the pain, but it gives us evidence to go look at it further.

"Coming from a kinesiology motor control perspective, I envision that there are good ways to move and bad ways to move. That is essentially what this project is trying to look at: the variability in wheelchair propulsion; is that related to shoulder pain?"

One obvious difference shown by the subjects in Sosnoff's experiment was between the ellipse of an experienced versus a novice wheelchair user. The digital images showed a variation from the motion for novice users when it came to the top of the rotation – the place where the hands were readjusted on the handrim for the next revolution.



Upwards of 60 to 70 percent of manual wheelchair users develop shoulder pain. For individuals who walk, if we hurt our shoulder, we essentially stop the activity, whether it's swimming, racquetball, whatever, that caused it. If someone is depending on their wheelchair for mobility, they are not fortunate enough to be able to stop that movement.

– Jacob Sosnoff

The idea for the wheelchair study also has roots in Sosnoff's home college of Applied Health Sciences, which also includes the Division of Disability Resources and Educational Services that supports people with disabilities on campus. It is a setting that allowed him to interact with students with disabilities, including wheelchair athletes, and learn about the challenges they face.

"We intermingled and we had some students who were on the wheelchair team," Sosnoff said. "It just sort of happened. It was the right place at the right time. I became aware of the shoulder pain issue and, doing some research, I found that no one had looked at it from the perspective that I take. I saw the door wide open so to speak."

It is research that, Sosnoff hopes, will lead to solutions for the problem of manual wheelchair user injuries.

"I was trained as a theoretical motor control person and one of the reasons I got into this project, in addition to being one of the few in the world and not talking to anyone about my research, was I realized that with all of this training and this work I wasn't necessarily helping anyone," Sosnoff said. "So applying these theories to actually help somebody is definitely a personal goal, but also an educational goal. Would these interventions work? That's my hope. My goal is to do random clinical trials to see if we can help shoulder pain, gait dysfunction, any mobility disability."

Sosnoff is also collaborating with Beckman Institute Director Art Kramer and researcher Mark Neider on a project that involves putting wheelchairs in ISL's CAVE™ immersive virtual reality environment. The CAVE had been playing host to a research line looking at pedestrian distraction that had subjects walk on a treadmill set inside the virtual reality environment's wall-sized screens displaying a virtual street crossing.

"We're replacing the full-size treadmill with a kid's treadmill and then the kid's treadmill with a roller assembly for stationary wheelchair testing," Sosnoff said.

In that study, as with the wheelchair propulsion research, Sosnoff will be breaking new scientific ground in order to potentially help people.

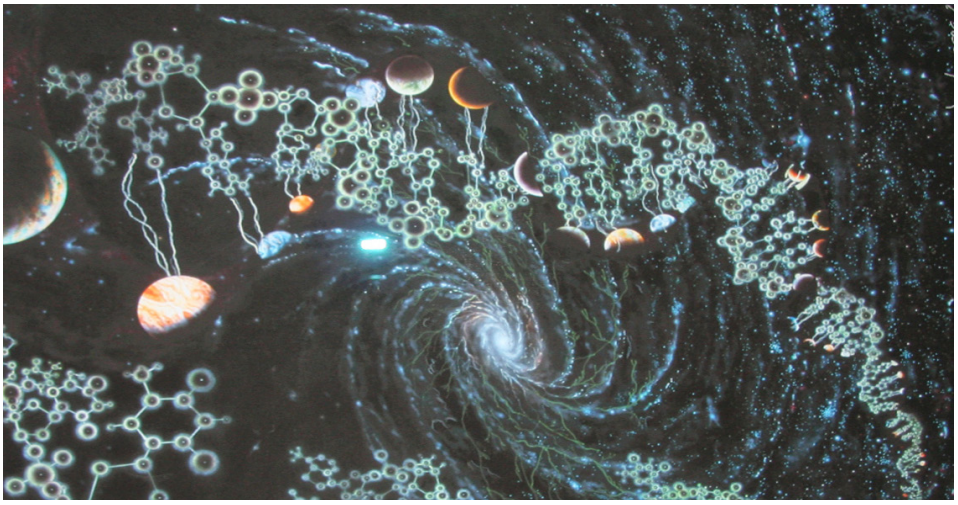
"Historically people who looked at locomotion mainly looked, for obvious reasons, at walking and running," Sosnoff said. "But with the graying of America and increased trauma care we are ending up with more and more people using wheelchairs for mobility."

And, Sosnoff adds, there has been little interdisciplinary work in this area. It was the expertise of Hsiao-Wecksler in mechanical science and engineering, Sosnoff's background in kinesiology, and the capabilities of the motion capture suite that made this research possible.

"The problems we face as a society or as scientists are so complex, to think that you can solve them with training from a specific field is fairly naïve," Sosnoff said. "Every discipline has strengths and I think you need to take those strengths and bring them together to solve these bigger issues and make bigger jumps in science.

"I think if we try to tackle it from just one perspective at a time it will a, take us longer, and b, we'll end up with bodies of science that don't necessarily talk to each other. So the answer could very well be out there in the engineering field or the kinesiology field and there needs to be some cross-breeding so to speak to get the final answer out. We can skip that step and do it in an interdisciplinary way to start with."

ASTRONOMIC



From representations of nature invisible to the human eye to the unimaginable expanses of space, back-to-back exhibits at the Krannert Art Museum have given visitors visionary views of the Earth and the stars from molecular to galactic scales.

The fist exhibit, titled *Imag(in)ing Life:"Nature in her genius had imitated art,* focused on the natural world of Earth. The current exhibit, running through Dec. 30 at Krannert's Intermedia Gallery, is titled *Astronomic!* and highlights the history of imagining and imaging the Universe from the 15th to the 21st centuries in a variety of media. The exhibit is sponsored by Krannert Art Museum's Intermedia gallery, in collaboration with the Beckman Institute. Guest curator is Hank Kaczmarski, Director of Beckman's Illinois Simulator Laboratory.

Kaczmarksi chose the words of the Roman poet Ovid to introduce both exhibits, including this from *Metamorphoses* about the seemingly innate human desire to get closer to the stars, even if only though their eyes: "And though all animals fix their gaze upon the earth, he gave to man an uplifted face and bade him stand erect and turn his eyes to heaven."

Astronomic! includes a half-a-millennium old work, the 1493 *Liber Chronicarum*, an astonishingly accurate 1944 painting of Saturn observed from one of its moons, and the sun in both modern sculpture and image form. Visitors can also take galactic 'rides" at *Astronomic!*, soaring through the Universe in a domed screen displaying space tours courtesy of the Microsoft Research Worldwide Telescope, and via the 3-D immersive virtual reality CANVAS environment showing our own Milky Way and 30,000 other galaxies.

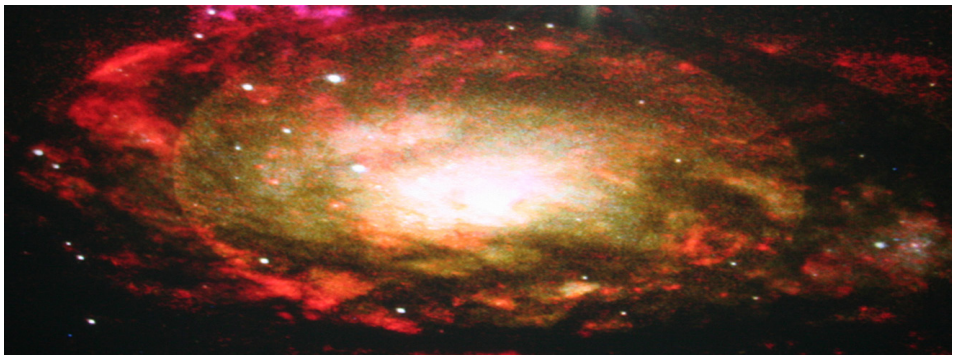
IMAGES

Interstellar Communication as Genetic Activity (left) is a print of a painting by Joe Lomberg, a collaborator of astronomer Carl Sagan, who called the piece "DNA Embraces the Planets."

Below, top row: In turning our gaze to the heavens we often feel there is an "eye" looking back, an impression conveyed in the piece Sophia at 10^{10} through images of eyes, such as the famous CBS "eye" seen here, superimposed on images from space.

Below, 2nd row, far right: a 1493 folio edition of the *Liber Chronicarum* on loan from the University of Illinois Rare Book and Manuscript Library.

Below, 2nd row, left: A 1944 copy of *Life* magazine and print of Saturn as Seen from Mimas by artist Chelsy Bonestell are displayed next to a photo of Saturn taken by Voyager 2 in 1981 illustrate the amazing accuracy and beauty of Bonestell's work.



For a virtual tour of ASTRONOMIC click **here.**

ALUMNI PROFILE

Beckman gave me a real impression of a functional setting where interdisciplinary research is actually happening, where all these different disciplines are in one place.

jeff grossman

Jeff Grossman's first exposure to interdisciplinary research came when he joined the Beckman Institute in 1994. The experience made a lasting impression.

Grossman, a professor and researcher at MIT, is not only a believer in an interdisciplinary approach to doing research, but a passionate advocate on the subject. He created an experiment for generating possible research ideas that he called speedstorming (speed brainstorming) in which two students from different disciplines had four minutes to come up with a possible topic to explore together. Grossman and his collaborators produced two papers on the possibilities of generating cross-disciplinary ideas using speedstorming, but the experiment is but one example of Grossman's commitment to thinking creatively about doing research.

Grossman, who is the Carl Richard Soderberg Associate Professor of Power Engineering and holds appointments in the departments of Materials Science and Engineering and Mechanical Engineering at MIT, has a research focus on developing advanced algorithms to address challenges in science and technology, especially in the area of energy conversion and storage. His research group at MIT (http://zeppola.mit.edu/) testifies to his commitment to the interdisciplinary approach.

"In my own research group I strive to have people with different backgrounds," Grossman said. "I have postdocs with strong chemistry backgrounds, strong physics backgrounds, strong materials science backgrounds, and strong mechanical engineering backgrounds – all in the same group. What you get is an overlap of phase space between these different disciplines that I believe creates more opportunity for intersection and ideas. I think it also provides a really nice environment for the student."

And this belief in the benefits of cross-fertilization between disciplines goes back to his days at the University of Illinois, earning a Ph.D. in physics, and working with former Beckman faculty member David Ceperley. Grossman said his experience at the Beckman Institute had a big influence on him.

"Beckman gave me a real impression of a functional setting where interdisciplinary research is actually happening, where all these different disciplines are in one place," he said. "That early view was very helpful in showing me that this is interesting. As a student experiencing that, I found it exciting and I internalized it. I said this is something that not only should be reproduced in other buildings, institutes and campuses, but could be a model for a group itself."

Grossman's research approach is also highly translational, with potential applications in the areas of solar cells, energy conversion and storage, and solar fuel, to name a few examples. A recent paper on which Grossman was corresponding author reported on a thermo-chemical approach to capturing the sun's energy for storage and usable heat that has advantages over traditional photovoltaic technology. http://bit.ly/ez2gjh

Grossman's contributions to projects are on the computational side, employing theory and creating simulations that can then be used by experimental groups toward developing solutions to energy-related issues.

"I develop and apply computational methods that we use to probe how energy conversion and storage work in different materials," Grossman said. "Any kind of energy conversion and storage material whether it be a solar cell, battery, hydrogen storage, solar fuel – all of these things go through certain fundamental processes, a set of mechanisms.

"We use computational tools to do two things: one, understand those mechanisms and predict what they are at a very basic level, and two, use that understanding and insight about what makes these tick to make advances – whether they be incremental or game-changing – in the costs of those materials."

Grossman has a big picture perspective on the longer term goals of his research, choosing energy topics for a very specific reason.

"I wanted to work on something that is directly relevant to global challenges," he said. "It keeps me up at night, it gets me excited, and to connect the work that I do to real problems that society is facing is exciting to me."

Grossman advises students to be just as passionate about whatever path they choose to follow, regardless of the discipline.

"All of these disciplines are wonderful for giving a solid foundation in terms of what you want to go after, but think about what it is that is going to get you most excited," he said. "I think students need to keep that in mind as they go through their studies; what really is captivating them? How do they want to make a difference?

"Sometimes that gets a little lost with all the exams and stress and just wanting a degree. I think it is important to think about what is it that keeps you engaged and working on these problems."

Beckman Institute Open House 2011 Set for March 11-12

Beckman Institute Open House 2011 will, as in past years, be held in conjunction with Engineering Open House at the University of Illinois, and will be a two-day event, March 11-12.

Every Beckman Open House features new exhibitions highlighting some of the research taking place at the Institute, but the 2011 edition will have some popular exhibits in new locations and some exciting new additions for visitors to consider.

One such new entry slated to join the fun in 2011 is Bert, the iCub humanoid robot from Steve Levinson's Language Acquisition and Robotics group. The lab took possession of the iCub earlier this year and Levinson says they will be ready to roll the rare (only one in the Western Hemisphere) advanced robot out to wow Open House crowds in March.

This year's Open House geography will have a little different look. The atrium and group labs will still play host to most of the exhibits but one change is a result of the Biomedical Imaging Center (BIC) and the Illinois Simulator Laboratory (ISL) swapping locations last year. BIC's equipment was relocated to the Beckman Institute building, while ISL was moved down to the south campus in BIC's former building.

For the 2011 Open House, ISL will bring its always popular virtual reality environments north to room 1005 of the Institute.

The Biomedical Imaging Center relies on mock magnets to acquaint test subjects with the experience of being in a magnetic resonance imaging machine. For past Open House events, BIC created a mock magnet in the Beckman atrium, but with mock magnets already in place on Beckman's first floor, the exhibit can highlight BIC research in its natural home.

The Beckman Institute Open House is a biennial event that always draws thousands of visitors. The 2011 Beckman Institute Open House will be held March 11-12 in conjunction with Engineering Open House on the University of Illinois campus.

The Beckman Institute Open House is a biennial event. The 2009 Open House featured more than 30 exhibits showcasing the research work that takes place at Beckman, including fun and interesting research topics such as brain-computer interfaces, robots learning grammar, and the process of photosynthesis as rendered through 3-D computer simulations. Open House visitors donned goggles to simulate alcohol intoxication and tried to shoot baskets, spelled out sentences using only their brainwaves, and took the helm of an electron scanning microscope.

The Beckman Institute Open House always draws thousands of visitors and the 2011 event may just outshine those of the past. Information on the Beckman Institute Open House will be posted to www.beckman.illinois.edu in early January.

Connected!

Beckman Institute Creates Presence on Social Media Sites

The Beckman Institute is linked in, tweeting, and friending, reaching out to alumni, faculty, students, and our friends through social media sites to share the exciting news of our research efforts.

Facebook
www.facebook.com/BeckmanInstitute

Linkedin
www.linkedin.com/oups?gid=1836347&trk=myg_ugrp_ovr

Twitter
www.twitter.com/BeckmanInst

YouTube
www.youtube.com/BeckmanInstitute

So, check us out at these sites and share the news about the Beckman Institute and the leading edge interdisciplinary research that takes place here every day.

SYNERGY is a publication of the Communications Office of the Beckman Institute for Advanced Science and Technology at the University of Illinois at Urbana-Champaign. Each issue spotlights the people and science that make the Institute one of the premier facilities for interdisciplinary research in the world.

Editor: Sue Johnson johnso16@illinois.edu
Writer: Steve McGaughey smcgaugh@illinois.edu
Web: Jordan Lowe jtlowe@illinois.edu
Video: Steve Drake sjdrake@illinois.edu

FACULTY PROFILE

When Florin Dolcos arrived at the University of Illinois earlier this year, he brought along a healthy research line investigating the neural mechanisms underlying emotion-cognition interactions. Dolcos plans to not only continue but expand on those topics as a full-time member of the Beckman Institute's Cognitive Neuroscience group.

Dolcos came to Illinois from the University of Alberta, Canada, where he got his first faculty position in the Department of Psychiatry, and where he earned a Ph.D. that included extensive field work and collaborations at Duke University's Center for Cognitive Neuroscience. Dolcos's research includes studying topics such as post-traumatic stress disorder (PTSD), sleep deprivation, social cognition, and depression – all with one underlying theme.

"My main research interest is in emotion-cognition interactions, with a focus on the associated neural correlates as studied with brain imaging tools," Dolcos said.

Dolcos, an Assistant Professor of Psychology at Illinois, looks at how emotion can impact cognitive processes such as memory and attention, and vice versa, and investigates the neural mechanisms involved in that interaction. He studies topics such as sleep deprivation because of the insight they can provide into emotion-cognition interaction.

"People want to stay focused on something but they might get distracted by emotional stimuli or thoughts," Dolcos said. "These are the two main directions in my research, looking at how emotion enhances cognition on the one hand and how it could also impair cognition on the other hand.

"You might see differences in people with PTSD or even within larger healthy populations some individuals might be more marked by an emotional event than others. The idea is to see what the neural mechanisms are and see whether variation in individual responses might be linked to differential vulnerability to clinical conditions like post-traumatic stress disorder, or to depression or anxiety, if they are exposed to extremely challenging emotional situations. One aspect where this interaction between emotion and cognition is pushed to diverge is sleep deprivation."

Dolcos said the topic of sleep deprivation is a natural one to study for his research interests.

"You get tired, it's more difficult to stay focused; this is the cognitive aspect," he said. "But at the same time you might also expect with sleep deprivation people get more nervous, or impatient, or might more easily lose their temper. That's the emotional component. So you see the two components that are part of my research, looking at how emotion and cognition might interact."

Dolcos wants to do more on this research line at Beckman, but he can say this about his findings so far: "The message is rather simple: the outcome of sleep deprivation doesn't solely depend on what happens to one or the other of the two systems, the cognitive or the more affective; it's the interaction between them."

Dolcos also has done studies of soldiers returning from war with post-traumatic stress disorder and people with depression, as well as studies of healthy populations, in order to gain insight into emotion-cognition interactions.

These are the two main directions in my research, looking at how emotion enhances cognition on the one hand and how it could also impair cognition on the other hand.

Florin Dolcos

"Affective-cognitive interactions are something we see every day," Dolcos said. "Even now I'm speaking faster and don't say all of my words because I want to say everything at once. Or you could be in a bad mood and you don't really have motivation to do things; virtually everything could be affected cognitively by the fact that you may be in a bad mood on a particular day. The influence of a bad mood on behavior is brought to an extreme in depression, and hence understanding alterations in emotion-cognition interactions in depressed patients is also critical.

"Emotion is part of our daily lives. If it's something exciting, we're going to remember that better. Memory is a cognitive process; something

that makes an event exciting, either positively or negatively, is going to influence the memory for that event. At the same time emotions can be distracting and this can influence different aspects of cognitive tasks."

As examples in which emotion can affect decision-making, Dolcos mentioned grocery shopping while hungry and drivers who become distracted by an accident and may cause another accident. Some of these everyday situations include time-honored admonitions about not letting our emotions affect our performance of a task or how we react to certain situations.

"Don't go shopping when you're hungry. Sleep on that. Don't decide now, count to 10. All of these have behind them how emotion interacts with cognition," he said. "Count to 10 is a typical example of where you can regulate or control your emotional processing. On the other hand, it's not only the impact of emotion on cognition, but it's also the impact of cognition on emotion.

"Emotion-cognition interactions are also important in the way we interact with other people. It does not take much to decide whether seeing a smiley or a frowned face makes you want to approach or avoid a person."

The aspects of the emotion-cognitive interactions Dolcos studies can also apply to real life situations found at a university.

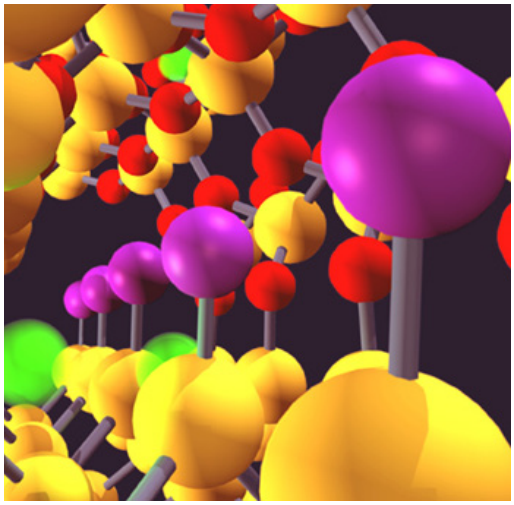
"Within healthy behavior sleep deprivation is also pushing the limits in terms of how the balance between emotion and cognition might be influenced," he said. "With increased tiredness both of these systems are influenced.

"They are also part of the daily life in many professions, including in academics," he added with a laugh.

Office of Technology Management: Helping Researchers Navigate Intellectual Property Disclosure

Researchers at the Beckman Institute and the University of Illinois are constantly making new discoveries and innovations that have the potential to have great impact on our society. Sometimes, however, facilitating and protecting these discoveries can be tricky territory to navigate. Luckily the Office of Technology Management (OTM) is here to help. As OTM states on the website, their mission is to encourage innovation, enhance research, and facilitate economic development through the transfer of intellectual property.

The Beckman Institute and its faculty members are no stranger to invention disclosure, patents, patent applications, and start up business ventures and they have successfully worked with OTM on numerous projects. In fact, in a 10 year report (2000-2009) of the history of the results of IP disclosures, the Beckman Institute's most recent year of data shows Beckman Institute technologies accounted for approximately 16 percent of the IP disclosures, 29 percent of the patent applications, 26 percent of the patents issued, and 24 percent of the licensing agreements.



The image above illustrates enhanced transistor lifetime through deuterium processing.

OTM has been increasingly active on campus and their data shows that 70 percent of their available portfolio has been actively marketed. They also continue to maintain their presence within the Beckman Institute which began three years ago. Steve Wille, senior technology manager at OTM, spends at least one day a week at the Beckman Institute to help researchers identify and evaluate IP, as well as provide faculty with guidance and education through the patent, licensing, and commercialization processes.

In 2010, the University of Illinois at Urbana-Champaign executed 40 licenses and options, including the first significant license covering the use of deuterium in semiconductor devices. Beckman researchers Joe Lyding and Karl Hess had their first discovery moment in 1996, but it wasn't until 2010 that the licensing agreement was finally signed. In a Beckman Institute news story posted on January 27, 2010 (http://www.beckman.illinois.edu/news/DeuteriumInChips) Lyding said patience is the key to success.

"The University of Illinois deserves a great deal of credit for exhibiting the institutional patience needed to see the deuterium technology through the 13 years from discovery to a license agreement," Lyding said. "At many times during this period the entire process was fragile and could have easily succumbed to internal or external pressures. In view of the costs and the risks, decisions had to be made at the highest levels to keep the entire process afloat."

Other Beckman faculty members that have had technologies recently licensed include Scott White (self-healing materials and CornBoard™), Stephen Boppart (optics/tissue imaging), Kenneth Suslick (colorimetric sensing), Rohit Bhargava (chemical imaging for cancer pathology), John Katzenellenbogen (inventions for pharmaceutical creation), William King (microstructured patterns), Yoram Bresler (CT construction algorithms), and Klaus Schulten (computational dynamics).

How to Support Beckman Institute

Donations to the Beckman Institute can be made by visiting the Institute's Giving page:
http://www.beckman.illinois.edu/giving/gifts.aspx

Gifts by check or money order should be made payable to the University of Illinois Foundation and should be mailed to:
University of Illinois Foundation
1305 West Green Street
Urbana, IL 61801.

If you would like to make a gift by phone, please call 217.333.0810.

If you have any questions about giving opportunities with the Beckman Institute for Advanced Science and Technology please contact:
Tim Montague
Director of Development
217.244.2887
tgmontag@illinois.edu.

HONORS & AWARDS

Pop Wins PECASE Award

Pop

Eric Pop of the Beckman Institute's Nanoelectronics and Nanomaterials group has been named by President Barack Obama as recipient of a Presidential Early Career Award for Scientists and Engineers (PECASE). This award is the highest honor bestowed by the United States government on science and engineering professionals in the early stages of their independent research careers.

Huang Receives NSF Grant to Advance Cloud Computing

Huang

Beckman Institute researcher Tom Huang and a team of his students have garnered a National Science Foundation grant to develop a system that could make cloud computing more efficient and easier to use. Huang, Co-chair of Beckman's Human-Computer Intelligent Interaction research theme, and his students received an Early-Concept Grant for Exploratory Research (EAGER) from the NSF to develop an efficient search algorithm toward applications in cloud computing.

Grant Awarded to Develop New Diagnostic Approach to Prostate Cancer

Bhargava

Beckman Institute researcher Rohit Bhargava led a successful effort that secured a grant from the National Institutes of Health to develop a new diagnostic approach for prostate cancer. The award is a five-year grant for $1.5M to develop a systems pathology approach that uses infrared spectroscopic imaging for diagnoses and assessments involving prostate cancer. Bhargava's research has been pioneering in developing chemical imaging methods for medical and research applications. His research seeks to create an automated method for determining whether certain kinds of prostate cells have the potential to cause life-threatening cancer.

Beckman Team Members Score Highest at Image Competition

Beckman Institute researcher Tom Huang led a team that finished with the top three scores at the ImageNet Large Scale Visual Recognition Challenge 2010. The competition tests teams from around the world on the accuracy of their object classifier algorithms used to retrieve and identify content in images. The team was composed of Huang, and members of the Image Formation and Processing (IFP) group he heads at Beckman, as well as members from the NEC Corporation and a member from Rutgers University. IFP team members are Liangliang Cao, Zhen Li, Min-Hsuan Tsai, and Xi Zhou. The competition was held in conjunction with Visual Object Classes Challenge 2010 sponsored by the Pattern Analysis, Statistical Modeling and Computational Learning (PASCAL) Network of Excellence. ImageNet is an ongoing research effort to provide researchers around the world an easily accessible image database.

Beckman Researchers Earn NSF MRI award

Jeff Moore, Nancy Sottos, Ralph Nuzzo, John Rogers, and Rohit Bhargava are co-principal investigators on a National Science Foundation Major Research Instrumentation award that will bring a new confocal Raman microscope to the Beckman Institute's Microscopy Suite. Key research areas that will benefit from this microscope include self-healing systems, multi-functional polymers, electronic materials, and cells and tissues. This instrument will be the only of its kind on the University of Illinois campus.

Zhong Receives NIH New Innovator Award

Beckman faculty member Sheng Zhong has been chosen to receive the New Innovator Award from the National Institutes of Health. Zhong is an assistant professor in bioengineering and his proposal, titled *Rewirable gene regulatory networks in the pre-implantation of embryonic development of three mammalian species* reflects his research group's efforts to model the evolution of gene regulation and animal development.

Aluru, Roth Named University Scholars

Beckman Institute faculty members Narayana Aluru and Dan Roth have been named University Scholars. Aluru is Co-chair of the Molecular and Electronic Nanostructures research theme while Roth is a researcher in the Artificial Intelligence group.

Brown, Moore, Suslick Elected ACS Fellows

Beckman Institute Founding Director Ted Brown and current faculty members Jeff Moore of the Autonomous Materials Systems group and Kenneth Suslick of the Bioimaging Science and Technology group were elected as 2010 fellows of the American Chemical Society.

Tajkhorshid Recognized as Exceptional by Campus Committee on Tenure

Tajkhorshid

Emad Tajkhorshid was recognized as exceptional in terms of quality of work and overall achievement by the Campus Committee on Promotion and Tenure. Tajkhorshid was just one of four who received this honor out of the 100 cases the Committee reviewed this year. This acknowledgement carries a $3,000 award to support his scholarly activities.

RECENT BECKMAN INSTITUTE RESEARCH
IN THE NEWS

Paper by TCB Researchers Named Most Downloaded

November 16 – A paper by Klaus Schulten and John Stone of the Beckman Institute's Theoretical and Computational Biophysics group was named the most downloaded by the *Journal of Molecular Graphics and Modelling*.

GPUcomputing.net

Microsensors Offer First Look at Whether Cell Mass Affects Growth Rate

November 16 – Researchers from the Beckman Institute are using a new kind of microsensor to answer one of the weightiest questions in biology: the relationship between cell mass and growth rate. Beckman Institute faculty members Rashid Bashir and Gabriel Popescu led the research, which was reported in the *Proceedings of the National Academy of Sciences*.

U of I News Bureau

Using LEDs for Biomedicine

October 22 – Beckman Institute researcher John Rogers has been a pioneer in developing novel technologies, including electronics that can be stretched or integrated with silk, that have potential uses in consumer devices and, increasingly for Rogers, in biomedicine. Rogers and his collaborators are now reporting on an implantable technology composed of inorganic LED semiconductors and photodetectors that is flexible and bio-compatible, ideal qualities for biomedical uses such as health monitors or in drug delivery.

Futurity.org

Suslick Develops Sensor for Shoe Bomb Explosive

October 19 – Kenneth Suslick of the Beckman Institute's Bioimaging Science and Technology group has applied colorimetric sensor technology developed in his lab toward detection of an explosive that has been used in shoe bomb attempts. Suslick's chemical sensor could be used in airports in the form of an inexpensive, easy-to-use handheld reader.

U of I News Bureau

Newsweek Features Shannon's Green Idea

October 18 – *Newsweek* magazine chose the research of Beckman Institute faculty member Mark Shannon into developing a device that can take human sewage and turn it into fresh water, methane, and minerals as an example of one of its 10 Big Green Ideas for trying to make green a reality.

Newsweek

Nanoneedle Delivers Quantum Dots to Cell Nucleus

September 28 – Min-Feng Yu, a Beckman Institute faculty member and professor of mechanical science and engineering at the University of Illinois, led the team that developed a tiny needle to deliver a shot right to a cell's nucleus.

U of I News Bureau

Creating Polymer Stamp for Printing on Curved Surfaces

September 22 – John Rogers of the Beckman Institute's 3-D Micro- and Nanosystems group collaborated on a project with researchers from Northwestern University that designed a square polymer stamp that easily picks up an array of electronic devices from a silicon surface and moves and prints them on a curved surface.

Northwestern University

Research Gives Insight into Using Graphene in Electronics

September 20 – New findings from the laboratory of Beckman researcher Joe Lyding are providing valuable insight into graphene, a single two-dimensional layer of graphite with numerous electronic and mechanical properties that make it attractive for use in electronics.

Futurity.org

Beckman Researchers Lead Study of Fitness Effects on Children's Brains

September 15 – A study of the effects exercise can have on the adolescent brain led by researchers from the Beckman Institute is the focus of an article in the *New York Times*. Lead author of the study is graduate student Laura Chaddock of the Human Perception and Performance group, with Beckman faculty member Charles Hillman and Institute Director Art Kramer as co-authors.

New York Times

Self-repairing Solar Cells

September 9 – Stephen Sligar of the 3-D Micro- and Nanosystems group is part of a collaboration with former Beckman Institute researcher Michael Strano that designed self-repairing solar cells.

Wired

Using nanoLAMPs to Illuminate Biomedicine

September 9 – Rohit Bhargava of the Bioimaging Science and Technology group has come up with an intriguing new class of molecular probes called nanoLAMPs that can be applied to a longstanding problem in the area of biomedical research.

Futurity.org