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FACULTY newsletter

CPMS Physical and Mathematical Sciences

ABOVE : CVLC members chat at the annual fall conference.

CVLC Connects Students & Careers

On October 8, 2010, the College of Physical and Mathematical Sciences (CPMS) hosted its College Volunteer Leadership Council (CVLC) for their annual fall visit.

The CVLC is comprised of accomplished friends and alumni of the college who give of their time to help further the educational mission of the college. Many of the members are leaders in their respective industries, giving them something unique to offer students who are preparing to enter the working world.

Twice each year, the CVLC meets with the college leadership to discuss initiatives that could provide new and better resources for students. These visits coincide with the university's homecoming celebrations in the fall and the college's Student Research Conference in the spring.

During the fall meetings, Dean Scott Sommerfeldt presented a report on the college. Presentations were also given by Dr. Jani Radebaugh, of the Department of Geological Sciences, and Dr. Brent Adams, of the BYU Center for Animation, along with their students. Dean Sommerfeldt commented on how these annual presentations provide the CVLC with a better feel for the good things happening in the college.

"Usually when people see the kinds of things that are happening, they tend to get much more excited about trying to make it even better, and trying to support it, whether that's financially, in terms of time and effort, or in trying to open up opportunities for us," he said.

Based on input from members of the CVLC, the college now offers a business practices seminar during winter semester where students learn basic business skills, as identified by those who've travelled the road before. Students who participated in its inaugural offering last year expressed a positive reaction to the course.

Some CVLC members are also involved in giving department colloquiums. These lectures raise awareness of needs in the world that students can address through their chosen field. Because of their experience in industry and business, members are able to show students the real-world applications of concepts from the classroom.

The wide range of mentorships and internships available in the college are

Continued on next page

ABOVE : Professor Dennis Eggett

Statistical Center Aids in Research

For professors and graduate students looking for help with data analysis in their research, the Department of Statistics' Center for Statistical Consultation and Collaborative Research affords a resource for academic research and analysis with help from the experts.

Professor Dennis Eggett has been managing the Center for the past 13 years. He employs three or four statistics graduate students to help professors from all over campus. The team typically collaborates on about 12 peer-reviewed publications a year.

"It's almost like an internal internship for [graduate students]," Eggett said. "It gives them an idea and a feel for what's it like to work with clients."

Though the Center has existed for nearly as long as the Statistics Department itself, it has only had a full-time manager for roughly 13 years. After passing it among faculty members on a rotating basis for several years, the department did an assessment and found that a permanent manager position was needed.

As an example of the services provided by the Center, Eggett was recently approached to do statistical analysis for Dr. Carl Hanson, of the Department of Health Science. Hanson provided the database, while Eggett did the analysis.

Eggett and Hanson worked together to analyze socio-demographic factors that may affect body mass index (BMI) among adolescents. They found that poverty-stricken areas and low physical activity increased BMI, while larger families and healthy diets lowered it. Age, gender and ethnicity also proved to influence BMI.

"It's more expensive to eat healthy and so the poverty-stricken tend to eat more unhealthy because it's cheaper and easier," Eggett said.

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CVLC Continued

provided in part by the efforts of the CVLC. Many of the council members donate generously from their own funds and time to support and enhance mentored student learning. Thanks to these mentoring opportunities, students from the college go on to find fulfilling jobs in a competitive market, as well as placement in top graduate programs. Dean Sommerfeldt identified this as one of the college's top priorities and one for which the CVLC is particularly qualified.

"Many CVLC members are affiliated with companies that may be looking to hire our students," he said. "Many have a different network than we do. They have friends and contacts that they can go to that we may not be aware of yet."

As the CVLC continues its partnership with the college, students can expect to see increased opportunities thanks to these exemplars of life-long learning and service.

by: Katie Pitts

Eggett Continued

"Also, [they are] less likely to be involved in sports because they don't have the money for [these] physical activities. They tend to be more sedentary, and so they have a higher BMI."

In poverty-stricken neighborhoods, the public recreation areas are usually found to be less safe or poorly maintained. Diets consist more of foods heavy in starch and high in sugars. The research was meant to influence what policy makers, health professionals and families can do to lower childhood obesity.

The Center for Statistical Consultation and Collaborative Research works with every department on campus and is available for professors, faculty members and graduate students. Contact Eggett for more information.

by: Meghan Fletcher

Professor Shares Success Stories

Many of history's great scientists and discoverers had to overcome difficult obstacles before rising to the top of their fields, a renowned professor and chemical engineer said at Brigham Young University's annual Reed M. Izatt and James J. Christensen Lecture.

Robert Byron Bird shared the stories of Emmy Noether, Paul Dirac, the Wright brothers and others who he said overcame various challenges to do great things. "These are fabulously interesting people," he told an audience on November 17.

A renowned German mathematician, Noether fought to study and teach at universities in a time when female students and professors were almost nonexistent. "She was a wonderful person," Bird said. "Everybody loved her."

Often teaching without pay, she helped many of her students earn doctorate degrees and developed Noether's Theorem, which shows the relationship of energy momentum and angular momentum to the properties of space and time.

Another critical theorem came from Paul Dirac, who Bird said was one of the "two most revolutionary, creative physicists of the twentieth century." Dirac overcame a difficult childhood to create an equation that satisfied both quantum mechanics and relativity and predicted the existence of positrons in atoms. He received the Nobel Prize at age 31.

"Everybody was amazed," Bird said. "Fantastic story."

Wilbur and Orville Wright were two others Bird said were two of his favorite pioneers. The brothers, who owned a bike shop in Dayton, Ohio, eventually began building and testing gliders, earning every cent for their research, materials and travel, Bird said.

The brothers developed the idea of wing warping and were the first to build a successful motorized airplane, which Orville first flew for a total of 12 seconds on December 17, 1903.

"Think of the progress we've made in the last century," Bird said. "Now we go to the moon."

Bird encouraged the audience to read about history's great scientists and discoverers and how they overcame obstacles. People should emulate these pioneers and glean as many ideas as they can from these stories, he said.

"Ideas are very closely related to progress," he said. "If Wilbur and Orville hadn't had their ideas about how to make a glider stable, they never would have been able to fly."

by: Justin Ritter

ABOVE : Dr. Robert Byron Bird

ABOVE : Professor Daniel Ess

Federal Department Calls on Chem Professor

Professor Daniel Ess, the newest member of the BYU Department of Chemistry and Biochemistry faculty, was recently appointed to the Center for Catalytic Hydrocarbon Functionalization (CCHF), a prestigious energy frontier research center funded by the U.S. Department of Energy.

Dr. Ess will be joining the CCHF as a principal investigator. "This means I am one of 12 professors at institutions from around the US that are focused on designing catalysts to selectively functionalize hydrocarbons; that is, to convert natural gas and other petroleum resources into more useful products. I will be directing computational research within my group and also collaborate with other principal investigators that perform experiments. Much of what I will do is to use theory to predict catalysts. The other principal investigators in this group are some of the world's most renowned chemists," Dr. Ess said.

"This is a great accomplishment and especially for a young assistant professor during his first year," Department Chair Dr. Greg Burton said.

The mission of the Center for Catalytic Hydrocarbon Functionalization as described on the Department of Energy's website is to "develop, validate, and optimize new methods to" change simple hydrocarbon molecules such as methane into more complex materials used in industry.

In addition, the CCHF's website states that "The Center for Catalytic Hydrocarbon Functionalization fosters collaborations between groups with expertise in catalysis, inorganic chemistry, electrochemistry, bioinorganic chemistry, materials chemistry, organic chemistry and quantum mechanics to enable fundamental advancements in the design and development of next generation catalysts for selective, low temperature, hydrocarbon functionalization."

The CCHF is led by the University of Virginia and is partnered with ten other notable institutions including University of California Berkeley, Princeton, and Yale University.

"It is a pretty big honor to be a part of this," Dr. Ess said.

by: Jessica Henrie

Physics Homecoming Float Honors Fletcher

Fifty years of acoustics research at BYU was celebrated in a big way when this year's homecoming festivities honored Harvey Fletcher, renowned physicist and founder of the BYU Acoustics Research Group.

Fletcher, known as the "father of stereophonic sound", accomplished many things throughout his career. Credited with the invention of the hearing aid and the audiometer, while at BYU Fletcher was the founding Dean of the College of Physical & Engineering Sciences and focused much of his research on musical acoustics.

As is traditional for Homecoming, a parade took place at 10 am on Saturday, October 9th. Among the many beautifully decorated floats ambling down the two-mile route was an entry honoring Fletcher.

"We thought it would be fitting to do something to honor both Harvey Fletcher the man, and what his work has led to," said James Esplin, a masters student in the Department of Physics & Astronomy and member of the Acoustics Research Group.

The float was designed as a timeline of acoustics research at BYU through the years. The front of the float had the now-antique equipment Fletcher used to conduct his research 50 years ago, while the back consisted of displays of the more visually interesting experiments of today. The middle was a towering collection of speakers, playing an informative track on Fletcher and his work.

"It was very interesting," said Melinda Cannon, a junior from Seattle, Wash. who attended the parade. "There was a lot to look at and listen to. It was really informative."

The hard work of the Acoustics Research Group paid off. Shortly before the parade began, they were rewarded with the "Best of Theme" award, and cheers followed the float along the route. Overall, it was a success and they are grateful for the experience.

Esplin explained that Fletcher's research and contributions afforded BYU opportunities to expand their acoustics and physics programs, and his legacy lives on through the work being done today.

"The BYU research has gone beyond what he [Fletcher] has done," Esplin said. "But thanks to his contributions, his legacy can not only live on, but has expanded to include so much more at BYU."

by: Meghan Fletcher

Searching Stone for a Hydrocarbon Haven

The rugged cliffs, picturesque arches and towering formations of south-central Utah have long captured the imaginations of adventurers, tourists and artists alike. But it's the rock underneath these marvels that has Thomas Morris excited.

A geology professor at Brigham Young University, Morris has studied the region's Entrada Sandstone since 2004 to learn more about the rock and determine if it could potentially hold oil or natural gas.

"Our reasons for doing it are not only for oil and gas potential, but are also academic in nature," Morris said. "Simply, what did the Earth look like at this moment in time?"

Areas where the famous sandstone meets an often-overlooked Entrada mudstone system have the potential to hold hydrocarbons. In these spots the porous sandstone is pinched off by non-permeable mudstone. Any oil or gas traveling upward through the sandstone would be stopped by the mudstone, trapping it and creating a reservoir.

"As we analyze the different depositional systems and their transitions we're always looking for the potential of some of these rocks to hold oil and gas somewhere else in the subsurface," Morris said.

To determine that potential, Morris and his students cut small plugs of rock from different outcrops of Entrada Sandstone and ran tests to determine how porous and permeable the stone is. By measuring these characteristics, Morris can predict how well the rock would hold hydrocarbons.

The team has recently collected samples of ancient volcanic ash interbedded with the sandstone and mudstone layers. These ash layers can be isotopically dated to help figure out when each layer of Entrada Sandstone was deposited as sediment. These dates will then help determine which units of rock correlate regionally.

"This regional correlation is really significant because it can allow geoscientists to view a snapshot, or time slice, of what Utah's landscape looked like," Morris said. "That's what people use through time to prospect for oil."

Parts of the study have already been published, but Morris continues to find new questions and problems for students to work on and try to answer.

"We're seeing a lot of unexpected things going on," Morris said, "which leaves us many more puzzles to solve."

by: Justin Ritter

Joint Staffer: Military Uses Math

The skills and concepts learned through mathematics can be applied to innumerable jobs in the workforce, a Pentagon official told students at a recent "Careers in Mathematics" lecture.

ABOVE : Major Eric Murphy

"It's used everywhere," said Maj. Eric Murphy, an operations research analyst on the Pentagon's Joint Staff, on Nov. 11. "Math gives you a set of skills that you can apply in a lot of different ways."

Murphy, who holds a Ph.D. in mathematics, said that while he almost never applies the complex fields he studied during his doctoral program, math plays an important role as he solves problems for some of the nation's most important decision-makers.

"You take that problem apart into all its constituent pieces, figure out how each of those pieces work alone, ... figure out how the pieces talk to one another and think about what the consequences are for different interpretations," he said. "That's math!"

Whether it's determining whether to buy new fighter jets or deciding how to employ a defense system, Murphy learns how different pieces of technology work and designs experiments to test how different elements work separately and together.

"To answer a question about whether I should buy forces or not buy forces, I have to be able to build a model of the world in which I can evaluate the goodness of those claims," he said. "This isn't fancy math we're doing," he said. "But the thought process is mathematical, and any one of you can do it."

After working through the problem, Murphy takes his findings to some of the military's top brass and explains them in layman's terms. While he generally uses simple examples

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Murphy Continued

to present different options to his superiors, he remembers a time he used a complicated math technique called circle packing to explain unmanned drone routes in Afghanistan.

"You wouldn't believe the look on the three-star's face when I put this in front of him!" he said with a laugh.

Murphy said an understanding of math can open many doors for students entering the workforce.

"If you can read the math that's going on in (a profession), then you've got a window into it that other people don't," he said. "That's been huge for me."

To watch Murphy's lecture, visit http://vimeo.com/channels/cpms#16940774.

by: Justin Ritter

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Announcements

Hands On
UAV Search & Rescue

College Christmas Luncheon
December 10
ESC Pendulum Court