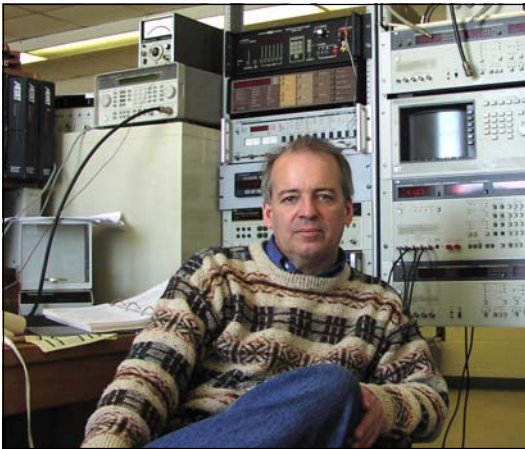


Hager Develops Hi-tech Methods to Monitor Cement Cure



Nathaniel Hager III, Ph.D., in his research laboratory within the Physics and Engineering Department

Dr. Nathaniel Hager III is president of Material Sensing & Instrumentation, Inc. and adjunct professor of physics at Elizabethtown College. He is a great asset to the department — performing research in his lab area, often involving student research assistants, and teaching a few physics courses most years. He came to Etown in 1994 to focus on high-frequency dielectric process monitoring under the US Small Business Innovation Research (SBIR) program. He has since received research grants from the US Army, the Commerce Department, and the National Science Foundation. Dr. Hager has received two patents for his research and has recently published an extensive article .

“Monitoring of Cement Hydration by Broadband Time-Domain-Reflectometry Dielectric Spectroscopy”, was published in the November 1, 2004, issue of the Journal of Applied Physics. The paper presents a novel method of embedding high-frequency electrical sensors in concrete structures to monitor the chemical state of water par-

ticipating in the cure process. The sensor is interrogated with a fast voltage pulse, producing reflected signals which are sensitive to chemically-unreacted water as compared to water combining with Portland cement. The signals can be tracked continuously during the cure process, producing a signature which can be used to diagnose concrete cure/strength.

(Hager continued on page 2)

“Educate for Service”

“*Educate for Service*” is more than a motto in the engineering department. For the second year, projects in the Fall semester Introduction to Engineering course have been community-based. This Fall, 36 first-year engineering students were enrolled in the course which was team-taught by Troy McBride and Jean Fullerton. The projects included a wheelchair ramp, proximity sensors for a power wheelchair, ten toy-boxes for families in transitional housing, basement access for a community center, CAD and GIS map work for a neighboring borough, the design of a standalone “green”-powered cabin, two dollhouses for a fundraising raffle, jigs to perform life skills for children with Down's Syndrome, and a vertical maze for a children's display. The engineering students showed diligence, creativity, and initiative in completing these projects. The students appeared to appreciate having real clients with a genuine need for the product. In the process, many important topics in the Introduction to Engineering curriculum were addressed, including teamwork, problem solving, design, communication skills, project management and the application of basic engineering principles, while involving the students in service learning.

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Service Learning (continued from page 1)



First-year engineering students Drew Graybeal, John Yarrish, and D.J. Lehr pose with their ten toy-boxes built for single-mother families in transitional housing.

Besides involvement with the local community, students also became involved from other departments -- Occupational Therapy students helped decorate the dollhouses while Fine Arts and Social Work students decorated the toy-boxes. The students did such a fine job that requests for next Fall's projects have already begun.

Details and other pictures can be found on our website under projects: http://www2.etown.edu/physics&engineering/projects/firstyear/egr100_fall_2004_projects



Top: Duane Breneman, Josh Brubaker, and Zach Galbraith work on a wheelchair ramp for a family in downtown Harrisburg
Bottom: The wheelchair ramp.



Armstrong's Engineering Manager, Rich Young (l), and Project Manager, Jim Fullerton (r), discuss topics with Professor Jean Fullerton for the Engineering Panel at the College.

Local Engineers Visit Department

Eight engineers from local industries came to Elizabethtown College on December 6, 2004, to speak to the First-Year "Intro to Engineering" class and upper class engineering students.

The panel members were Mike Galluppi (RR Donnelley), Stephanie Clay (Arro Consulting), Dan Steinbacher (Armstrong World Industries), Rich Young (Armstrong World Industries), John Batzer (New Cumberland Army Depot), Jim Pfister (Webber/Smith),

Jim Fullerton (Armstrong World Industries), and Andrew Reed (DEP).

These engineers covered eight disciplines and had a wide range of experience and career paths. The panel discussed their backgrounds, experience and career progression while offering useful "tips" to the students. This was an excellent opportunity for the students to learn about possible career paths and network with local engineers.

Hager (continued from page 1)



Dr. Hager's research setup for monitoring cement cure

Dr. Hager's research interests involve high-frequency measurement of materials, particularly Time-Domain-Reflectometry (TDR) Dielectric Spectroscopy to probe molecular rotation. Analysis of molecular rotation can be used to monitor cure of composite polymers used in the aerospace industry as well as hydration of concrete materials used in the construction industry. Other applications can be found in areas of oil exploration, display technology, characterization of wireless materials, biological applications, and structural-fault detection. In addition to SBIR and teaching part-time at the College, Hager maintains an active consulting and research business with a variety of university and corporate clients.



Dr. Michael A. Scanlin Presents New Model



Michael Scanlin, Ph.D., P.G.

Elizabethtown College associate professor of geosciences and engineering, Michael A. Scanlin, Ph.D., P.G., has presented a new structural model to explain the underground construction of the Appalachian Mountains of western Pennsylvania. Dr. Scanlin's research used seismic imaging, or underground

photography to take pictures of the Earth's crust underneath this region of the ancient folded mountain belt. These seismic pictures show the arrangement of the rock layers to a depth of 5 miles or 8 kilometers below the mountains.

The seismic pictures reveal that the mountain ridges on the surface are positioned directly above the geologic equivalent of speed bumps in a very old and very deep layer of ancient rock at a depth of approximately 8 kilometers or 5 miles below the surface. These deep geologic speed bumps or basement faults not only controlled how new rock layers were deposited above them but also cre-

ated a disturbance beneath these younger rock layers as they traveled over them as a result of the collision of segments of the Earth's crust, called tectonic plates, during the time period when these mountains were formed.

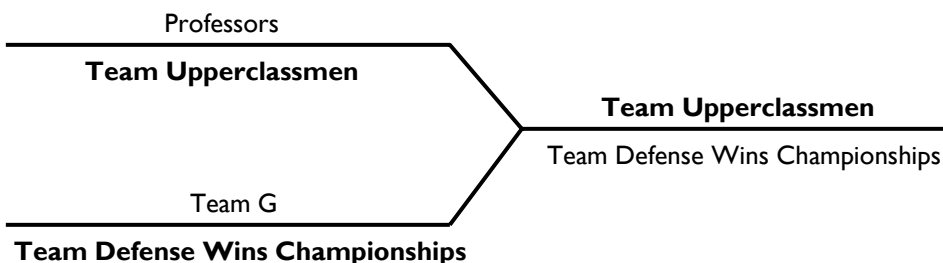
The younger rock layers were pushed westward over the geologic speed bumps in the deeper, ancient rock layer during the collision of the African and North American tectonic plates approximately 250 million years ago. This new evidence promises to provide closure to the long-standing geological debate regarding the role of deeply buried geologic speed bumps in the evolution of younger folded mountain ridges in this important region of the Appalachian Mountains.

The results of Dr. Scanlin's research were published in the June 2003 issue of American Journal of Science. Other aspects of his research have been published in Geology on the Edge, a publication of the Pennsylvania Conference of Geologists. Keep your eye out for his new article pending publication in the American Journal of Science that examines the structural style and kinematics of the Allegheny Structural Front.

March Madness Comes to The Department

On March 22, 2005, about 40 students and professors from Physics and Engineering came together to participate in their own March Madness tournament in Thompson Gym. Four teams were formed: "Professors", "Team Upperclassmen", "Team G", and "Team Defense Wins Championships". Second-year Physics Education major, Mark LaPalomato, who helped organize the event, had this to say, "March Madness was a lot of fun, and it was great to see everyone come out...when the championship game rolled around it was a heated battle. Both teams exchanged blows, but in the end Team Upperclassmen won. They should know, though, the only reason they won was because my teammates and I went easy on them since this could be their last chance to play before graduating...I want to congratulate the upperclassmen team". Team Upperclassmen consisted of mostly senior engineering students Jose Cruz, Jonas Groff, Chris Heisey, Jason Kreidler, Justin Shade, Snehes Shrestha, Sudip Shrestha, and Tom Yeager.

Thanks to everyone who came out, including Engineering professors Ferruzza, DeGoede, McBride, and Wunderlich, as well as History professor David Brown. Also thanks to Jeremy Davis and Christy Deller for their help with the clocks.



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Sights From Around the Department



March Madness basketball came to the Physics and Engineering Department. Five faculty and more than thirty students from the department organized and took part in a four-team tournament. [Left] The players gather around for the rules before the games begin and [Right] "Team Upperclassmen" (3rd and 4th-year students) takes on "The Professors".



[Left] "Team G" (1st year students) plays a game against "Team Defense Wins Championships" (2nd and 3rd year students). [Right] In the final game for the championship, "Team Upperclassmen" defeats "Team Defense Wins Championships".

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