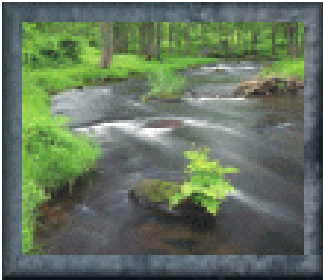




Career Cornerstone News

Volume II, Issue 4

April, 2006



Career Cornerstone News is a Publication of the Sloan Career Cornerstone Center, the Premier Online Resource for Exploring Career Paths in Science, Technology, Engineering, Mathematics, and Computing.

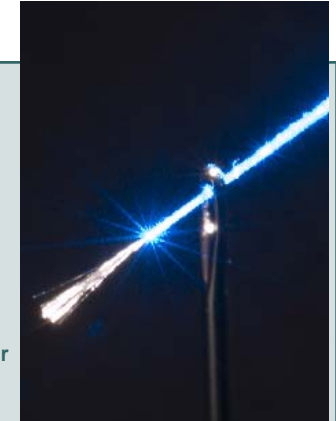
Inside this issue:

<i>New Process Builds Electronics Into Optical Fiber</i>	1
<i>What's a Degree Worth?</i>	1
<i>Science and Engineering Visualization Challenge</i>	2
<i>Degree Profile: Environmental Engineering</i>	2
<i>Project Takes Fish into the Digital Age</i>	3
<i>Strong Link Between Challenging Studies and Degree Completion</i>	4
<i>Science and Engineering Indicators 2006</i>	4

New Process Builds Electronics Into Optical Fiber

Scientists from Penn State University and the University of Southampton have demonstrated a new way to combine microelectronics and optical fibers -- a development that opens up potential applications in fields as diverse as medicine, computing, and remote sensing. The researchers discovered how to fashion a thin, flexible tube of ultra-clear glass (an optical fiber) that has a hollow core packed with microscopic wires made of a semiconductor such as germanium. The scientists then created solid-state electronic devices, including a transistor, inside the semiconductors.

"This advance is the basis for a technology that could build a large range of devices inside an optical fiber," says Penn State chemist John Badding, one of the lead authors of the report. Indeed, he says, it could help meet one of the greatest challenges in modern information technology. How do you rapidly and efficiently exchange information between optical fibers, which have proved to be the ideal medium for transmitting data (in the form of light pulses), and



A wire-packed glass fiber passes through the eye of a needle. The glass fiber is glowing from blue laser light. Each of the semiconductor wires emanating from its end is just 2 micrometers in diameter -- 20 times narrower than a human hair.
Credit: Neil Baril, Penn State

solid-state microelectronic devices, which are by far the most effective tools for manipulating and processing the data? "If the signal never leaves the fiber, then it is faster, cheaper and more efficient," says Badding.

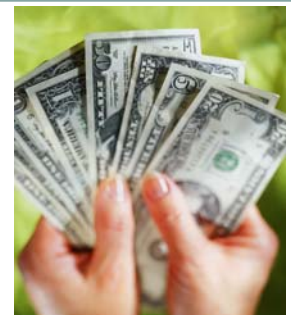
What's a Degree Worth?

The job prospects for new college graduates look encouraging as employers recently said they plan to hire 14.5 percent more new college grads in 2005-06 than they hired in 2004-05. But the increased number of jobs available isn't the only good news for these students; they can also expect to see higher starting salary offers, according to results of a new survey by the

National Association of Colleges and Employers.

As a sample, the salary showed that computer science graduates would earn an average starting salary of \$50,046.

Chemical engineering graduates saw an average salary offer of \$55,900; civil engineers earned \$44,999, electrical engineering were offered \$52,899, and the average offer to mechanical



engineering grads was \$50,672. Career Cornerstone includes current salary information and details about these and other degree fields at www.careercornerstone.org.

Science and Engineering Visualization Challenge

Some of the most powerful statements of science, engineering, technology, computing and mathematics are not made in words. From the diagrams of DaVinci to Hooke's microscopic bestiary, the beaks of Darwin's finches, Rosalind Franklin's x-rays or the latest photographic marvels retrieved from the remotest galactic outback, visualization of research has a long and literally illustrious history.

The National Science Foundation and Science, published by the American Association for the Advancement of Science, are

seeking participants for the fourth annual "Science and Engineering Visualization Challenge." The competition recognizes scientists, engineers, visualization specialists, and artists for producing or commissioning innovative work in visual communication.

The ability to convey the essence and excitement of research in digitized images, color diagrams, multimedia, and animation has given researchers the perspective needed to set new research directions and equipped other citizens to see and understand complex science concepts. Award



categories include: Photographs, Illustrations, Interactive Media, Non-Interactive Media, and Informational Graphics.

Winners in each category will be published in the September 22, 2006 issue of Science Magazine and Science Online and displayed on the NSF website. For more details, and last years winners, visit www.nsf.gov/news/special_reports/scivis.

Degree Profile: Environmental Engineering

Using the principles of biology and chemistry, environmental engineers develop solutions to environmental problems. They are involved in water and air pollution control, recycling, waste disposal, and public health issues. Environmental engineers conduct hazardous-waste management studies in which they evaluate the significance of the hazard, offer analysis on treatment and containment, and develop regulations to prevent mishaps.



They design municipal water supply and industrial wastewater treatment systems. They conduct research on proposed environmental projects, analyze data, and perform quality control checks. They provide legal and financial consulting on matters related to the environment.

Environmental engineers are concerned with local and worldwide environmental issues. They study and attempt to minimize the effects of acid rain, global warming, automobile emissions, and ozone depletion. They also are involved in the protection of wildlife.

Many environmental engineers work as consultants, helping their clients to comply with regulations and to clean up hazardous sites.



According to the U.S. Department of Labor, Bureau of Labor Statistics, environmental engineering graduates should have favorable job opportunities. Employment of environmental engineers is expected to increase much faster than the average for all occupations through 2014.

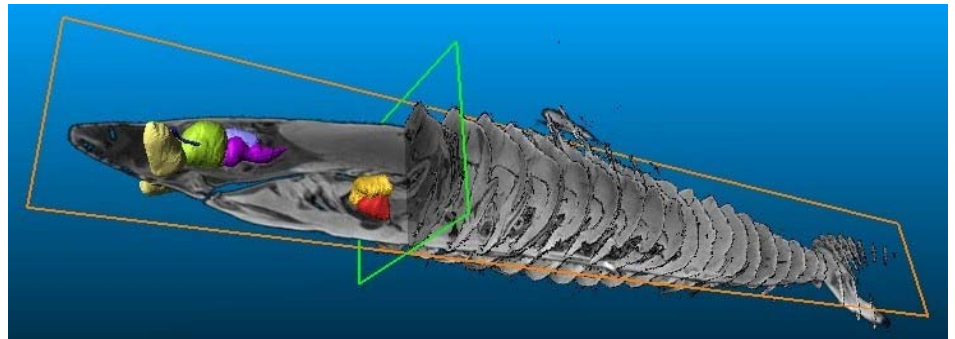
Find out more about careers in environmental engineering at www.careercornerstone.org.

Project Takes Fish into the Digital Age

The same medical technology used to image brain tumors and torn knee ligaments is now taking the field of marine biology to a new dimension: anyone with Internet access will be able to look at fish as never before. The National Science Foundation has awarded researchers at the University of California at San Diego and Scripps Institution of Oceanography a grant to use magnetic resonance imaging (MRI) to create a high-resolution, 3-dimensional, online catalog of fishes.

The five-year, \$2.5 million Digital Fish Library project will support development and application of new MRI technology that, in conjunction with novel data analysis and visualization methods, penetrates soft body tissue to provide 3-D images of physiological structures.

The plan is to image the internal anatomies of the entire range of



Novel application of MRI leads to new tools for online dissection of preserved fishes. Galapagos shark (*Carcharhinus galapagensis*)

Credit: UCSD Keck Center for fMRI

fishes. This variation is part of the challenge, as standard MRI is designed to image the anatomy of humans who slide inside large cylindrical "coils" that capture data that is then processed to create detailed computer images. New hardware will be developed to accommodate the shape of fish and differences in fish tissue.

The technology will enable researchers to acquire and process high-resolution data of various fish anatomies. Using this powerful and versatile imaging

tool, scientists, students and anyone in the public will be able to digitally probe and dissect these fishes online from anywhere.

Education modules within the Digital Dissection Tool will cover the basics of MRI, digital image processing of 3-D MRI data, as well as aspects of marine biology. Virtual dissections will help preserve fish specimens, unlike traditional, physical dissections that often destroy them. That is even more important with rare specimens.

Career Cornerstone Explores Career Paths in...

- Aerospace Engineering
- Agricultural Engineering
- Architectural Engineering
- Bioengineering
- Biology
- Chemical Engineering
- Chemistry
- Civil Engineering
- Computer Engineering
- Computer Science
- Electrical Engineering
- Engineering Technology
- Environmental Engineering
- Geosciences
- Industrial Engineering
- Manufacturing Engineering
- Materials Science and Engineering
- Mathematics
- Mechanical Engineering
- Nuclear Engineering
- Physics
- And more to come...



Find out more at www.careercornerstone.org

Strong Link Between Challenging Studies and Degree Completion

Completing academically challenging course work in high school dramatically increases the likelihood of a student earning a bachelor's degree, according to a recent U.S. Department of Education study. The study, *The Toolbox Revisited: Paths to Degree Completion From High School Through College*, found that the academic intensity of a high school curriculum is the strongest indicator of postsecondary degree completion, regardless of a student's major course of study.

The *Toolbox Revisited* studies the High School Class of 1992 as it moved from high school to higher education. Through high school and college transcripts, the study examines students who attended a four-year college at any time, including students who started out in community colleges. The data on which the study is based cover a period of eight and a half years for degree completion.

The study found that the academic intensity of the student's high school curriculum counted more than anything else in precollegiate history in providing momentum toward completing a bachelor's degree.

Academic intensity was defined as students who, through grade 12 in 1992, had accumulated:

- ◆ 3.75 or more Carnegie units of English
- ◆ 3.75 or more Carnegie units of mathematics
- ◆ highest mathematics of either calculus, precalculus, or trigonometry
- ◆ 2.5 or more Carnegie units of science or more than 2.0 Carnegie units of core laboratory science (biology, chemistry, and physics)
- ◆ more than 2.0 Carnegie Units of foreign languages
- ◆ more than 2.0 Carnegie Units of history and social studies
- ◆ 1.0 or more Carnegie Units of computer science
- ◆ more than one Advanced Placement course
- ◆ no remedial English; no remedial mathematics

View the full report at www.ed.gov/rschstat/research/pubs/toolboxrevisit.



Science and Engineering Indicators 2006

Citing a "changed world" in the global picture for science and technology, the National Science Board has released its biennial report "Science and Engineering (S&E) Indicators 2006." In doing so, members of the board appearing in a Capitol Hill briefing expressed concern that today's K-12 students in science and mathematics are not improving their learning relative to international peers, boding a potential loss for the United States of its global prominence in discovery and innovation. In recent years, mathematics scores have been rising slowly for U.S. students on national assessments, but they have not been doing the same in science. And internationally, U.S. students in both science and math still perform near the middle of the pack among industrial nations on the Trends in Mathematics and Science Study (TIMSS). Indicators 2006 also reports that the number of science and engineering degrees awarded at all levels is rising, especially bachelor's and master's degrees. Graduate enrollments also are on an upward course across all major U.S. demographic groups. Read the full report and find out more at www.nsf.gov/statistics/seind06.