



Career Cornerstone News

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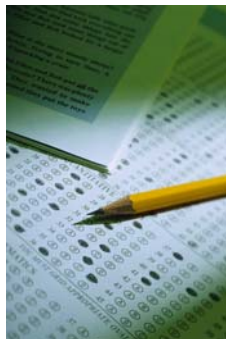
Career Cornerstone News is a Publication of the Sloan Career Cornerstone Center, the Premier Online Resource for Exploring Career Paths in Science, Technology, Engineering, Mathematics, Computing, and Medicine.

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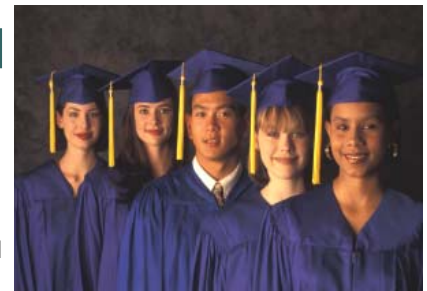
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Research on AP and College Success

Almost 15% of public school graduates from the class of 2006 achieved during their high school years an AP Exam grade of 3 or better -- the score that has been predictive of college success. The achievement represents a significant improvement since the class of 2000, when just 10% of public school graduates were achieving this result. The College Board, which



administers the AP Program, released the third annual Advanced Placement Report to the Nation. The Report also highlights new independent research, which bolsters previous research findings that students who participate in AP have significantly better college grades and college graduation rates than academically and economically similar students who did not take the demanding courses and exams. "After comparing



students with similar academic and economic profiles, these new studies show that the students who also succeed on an AP Exam are better prepared for the rigors of college, and more likely to obtain a bachelor's degree," said College Board President Gaston Caperton.

AP achievements for each state's class of 2000 and 2006 are detailed in the report, which is online at www.collegeboard.com.

Skin is Home to Bacterial Zoo

It appears that the skin, the largest organ in our body, is a kind of zoo and some of the inhabitants are quite novel, according to a new study. Researchers found evidence for 182 species of bacteria in skin samples. Eight percent were unknown species that had never before been described.

It is the first study to identify the composition of bacterial populations on the skin using a powerful molecular

method. Not only were the bacteria more diverse than previously estimated, but some of them had not been found before, says Martin J. Blaser, M.D., Frederick King Professor and Chair of the Department of Medicine and Professor of Microbiology at NYU School of Medicine, one of the authors of the study. The skin has been, he says, terra incognita, an unknown world that he and his colleagues have set out to understand



Photo Credit: Zhan Gao, M.D., Martin J. Blaser, M.D.

much like explorers, he says.

Find out more about career paths in medicine and biology at www.careercornerstone.org.

Scientists and Engineers Get the Oscar

Each year the Academy of Motion Picture Arts and Sciences awards its Scientific and Technical Achievement awards to the scientists and engineers who have designed and developed technologies that contribute to the progress of the film industry. These technical innovations have been successfully used in movies and have become the gold standard by which new technologies are judged.

One of this year's winners is Steve Sullivan, Director of Research and Development at Industrial Light and Magic (ILM). Steve worked with a team of electrical and

computer engineers to design and develop the ILM Image-based Model System. This system starts with one or more images of an object or scene, such as a landscape, prop, or humane face. Then, a combination of computer algorithms and artist tools are applied to create a 3D model.

"The resulting model is often comparable to a laser scan of the object," says Sullivan. "The system can help visual effects artists create detailed models



directly from a few photographs, even for subjects such as babies or large-scale landscapes which are impossible to scan using traditional techniques."

Find out more at www.ilm.com.

Degree Profile: Dentistry

Dentists diagnose, prevent, and treat problems with teeth or mouth tissue. They remove decay, fill cavities, examine x-rays, place protective plastic sealants on children's teeth, straighten teeth, and repair fractured teeth. They also perform corrective surgery on gums and supporting bones to treat gum diseases. Dentists extract teeth and make models and

measurements for dentures to replace missing teeth. They provide instruction on diet, brushing, flossing, the use of fluorides, and other aspects



of dental care. They also administer anesthetics and write prescriptions for antibiotics and other medications.

Most dentists are general practitioners, handling a variety of dental needs. Other dentists practice in any of nine specialty areas. Orthodontists, the largest group of specialists, straighten teeth by applying pressure to the teeth with braces or retainers. The next largest group, oral and maxillofacial surgeons, operates on the mouth and jaws.

The remainder may specialize as pediatric dentists (focusing on dentistry for children); periodontists (treating gums and bone supporting the



teeth); prosthodontists (replacing missing teeth with permanent fixtures, such as crowns and bridges, or with removable fixtures such as dentures); endodontists (performing root canal therapy); public health dentists (promoting good dental health and preventing dental diseases within the community); oral pathologists (studying oral diseases); or oral and maxillofacial radiologists (diagnosing diseases in the head and neck through the use of imaging technologies).

Find out more about dentistry at www.careercornerstone.org.

Cyber-enabled Discovery and Innovation

The infusion of computation into science and engineering has revolutionized how research is carried out and applied. Once used by only a handful of elite researchers on select problems, advanced computing has now become essential to future progress and exploration. Coupled with continuing improvements in microprocessor speeds, converging advances in networking, software, visualization, data systems and collaboration platforms are changing the way research and education are accomplished.

Still, the broad and complex questions posed by 21st Century inquiry require access to new information technology capabilities, such as distributed wired and wireless observing network complexes, and sophisticated simulation tools that permit exploration of phenomena that can never be observed or replicated by experiment. New concepts and tools are needed to address the challenges posed by a world of petascale computers grinding away

at 1 quadrillion operations per second, massive data flows and databases, and an economy dependent on digitally enabled activity.

In fiscal year (FY) 2008, the National Science Foundation (NSF) will begin the Cyber-enabled Discovery and Innovation (CDI) initiative to explore radically new concepts, approaches and tools at the intersection of computational and physical or biological worlds. CDI includes five themes:

- ◆ Knowledge extraction (including data mining, visualization and using basic concepts from computation, geometry and topology)
- ◆ Interacting elements (such as analyzing the flow of electricity or information across the power grid or Internet, describing protein folding and unfolding, and finding principles for scaling from the quantum to the nano to the macro scales)
- ◆ Computational experimentation (allowing insight into complex, real-world systems such as hurricanes, nerve synapse activity, or the Big Bang)
- ◆ Virtual environments (to enhance discovery, learning and innovation)
- ◆ Educating researchers and students in computational discovery (special focus will be placed on using virtual environments and cyberinfrastructure at all education levels)



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Science/Engineering Doctorate Degrees Continue to Rise

A recent report reveals that the total number of doctorate degrees awarded in science and engineering increased for the third year in a row in 2005 (27,974), surpassing the previous record set in 1998 (27,273). "The numbers are skyrocketing," said Susan T. Hill, director of the Doctorate Data Project in the National Science Foundation's (NSF) Division of Science Resources Statistics and co-author of the report titled U.S. Doctorates in the 20th Century. Released by NSF, this report documents trends and patterns that reveal the rapid growth and changing demographics of doctoral education during the 20th century.

Hill explained that the increase in science and engineering degrees could be attributed to the number of foreign citizens who have come to the United States to pursue a doctoral education. For instance, from 2001 to 2005, science and engineering doctorates awarded to

noncitizens increased by 25% and accounted for virtually all of the overall growth in science and engineering doctorate awards during that period. Hill added that 90% of these citizens decided to stay in the United States after they finished their education.

The report also found that several other demographic groups received record numbers of science and engineering doctorate degrees in 2005. These groups included women, U.S. Asian citizens, and underrepresented minorities. Science and engineering fields reaching new highs in the number of doctorates in 2005 included: biological sciences (6,368), engineering (6,404), mathematics (1,203), and computer sciences (1,136). The number of degrees in psychology and social sciences, on the other hand, remained unchanged from 2004. The report's major findings include the following:

- Two-year colleges increased their role in educating those who go on to pursue a doctorate education.
- From 1995 to 1999, almost a third of African American doctorate-degree recipients reported receiving an undergraduate degree from a historically black college or university.
- Men received 73% of all doctorates awarded in the 20th century. But in the 1990s, women made significant gains, earning more than 40% of all doctorate degrees.
- Foreign nationals held less than 10% of all doctorates before 1960. However, they received more than a third of all science and engineering doctorates by 1999.

Find out more at www.nsf.gov/statistics/nsf06319.

From Farm Waste to Fuel Tanks

Researchers at the University of Missouri-Columbia and the Midwest Research Institute in Kansas City have developed a method to convert corncob waste into a carbon "sponge" with nanoscale pores. The new material can store large quantities of natural gas and can be formed into a variety of shapes, ideal characteristics for next-generation gas storage tanks on methane-powered automobiles.

Using corncob waste as a starting material, the researchers created carbon briquettes with complex nanopores capable of storing natural gas at an unprecedented density of 180 times their own volume and at one seventh the pressure of conventional natural gas tanks. The breakthrough is a significant step forward in the nationwide effort to fit more automobiles to run on methane, an abundant fuel that is domestically produced and cleaner burning than gasoline.

In addition to efforts to commercialize the technology, the researchers are now focusing on the next generation briquette, one that will store more natural gas and cost less to produce.

