

# Career Cornerstone News

Volume IX, Issue II

May, 2013



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

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## Keyboards Shrink for Extra Tiny Devices

Technology blogs have been abuzz that smartwatches may soon be on their way from companies such as Apple, Google, Samsung and Microsoft. But as capable as these ultra-small computers may be, how will users enter an address, a name, or a search term into them? One solution is an iterative zooming technique developed and tested by researchers at Carnegie Mellon University.

Called ZoomBoard, this text entry technique is based on the familiar QWERTY keyboard layout. Though the full keyboard is impossibly small on a watch-size display, simply tapping the screen once or twice will enlarge an individual key until it can

be comfortably and accurately pressed. Capital letters can be typed by holding a key. A swipe to the left deletes a character. A swipe to the right types a space. An upward swipe calls up a secondary keyboard of numbers and other symbols. "You aren't going to write a novel, but it gets the job done," said Stephen Oney, a Ph.D. student in the Human-Computer Interaction Institute, part of Carnegie Mellon's School of Computer Science. "This opens up new possibilities for devices such as smartwatches, which



Image Credit: Carnegie Mellon

generally lack any means of entering text, as many aren't powerful enough for voice recognition."

The researchers say ZoomBoard also could be useful on larger keyboards for people who have movement disorders that make typing difficult or for people who are using their keyboards while jogging.

Find out more about careers in computer science at [www.careercornerstone.org](http://www.careercornerstone.org).

## Tiny Untethered Surgical Tools

By using swarms of untethered grippers, each as small as a speck of dust, Johns Hopkins engineers and physicians say they have devised a new way to perform biopsies that could provide a more effective way to access narrow conduits in the body as well as find early signs of cancer or other diseases. The team reports successful animal testing of the tiny tools, which require no batteries, wires or tethers as they seize internal tissue samples. The devices are called "mu-grippers." Instead of relying on electric or pneumatic

power, these star-shaped tools are autonomously activated by the body's heat, which causes their tiny "fingers" to close on clusters of cells. Because the tools also contain a magnetic material, they can be retrieved through an existing body opening via a magnetic catheter.

"This is the first time that anyone has used a sub-millimeter-sized device—the size of a dust particle—to conduct a biopsy in a live animal,"



This image depicts a mu-gripper near the opening of an endoscopic catheter. (Image Credit: Evin Gultepe, Gracias Lab, Johns Hopkins University)

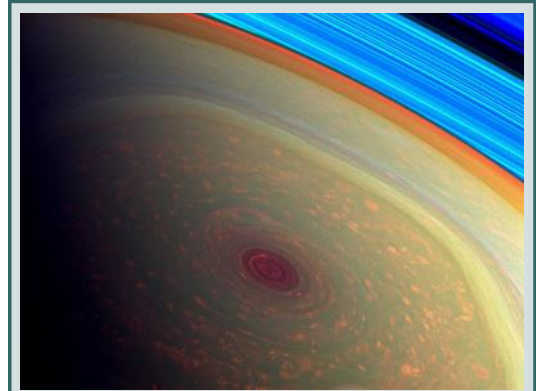
said David Gracias, an associate professor of chemical and biomolecular engineering whose lab team developed the microgrippers.

## NASA Examines Views of Saturnian Hurricane

NASA's Cassini spacecraft has provided scientists the first close-up, visible-light views of a behemoth hurricane swirling around Saturn's north pole. In high-resolution pictures and video, scientists see the hurricane's eye is about 1,250 miles (2,000 kilometers) wide, 20 times larger than the average hurricane eye on Earth. Thin, bright clouds at the outer edge of the hurricane are traveling 330 mph (150 meters per second). The hurricane swirls inside a large, mysterious, six-sided weather pattern known as the hexagon. Scientists will be studying the hurricane to gain insight into hurricanes on Earth, which feed off warm ocean water. Although there is no body of water

close to these clouds high in Saturn's atmosphere, learning how these Saturnian storms use water vapor could tell scientists more about how terrestrial hurricanes are generated and sustained.

Scientists believe the massive storm has been churning for years. When Cassini arrived in the Saturn system in 2004, Saturn's north pole was dark because the planet was in the middle of its north polar winter. During that time, the Cassini spacecraft's composite infrared spectrometer and visual and infrared mapping spectrometer detected a great vortex, but a visible-light view had to wait for the passing of the



*This spectacular, vertigo inducing, false-color image from NASA's Cassini mission highlights the storms at Saturn's north pole. (Image credit: NASA/JPL-Caltech/SSI)*

equinox in August 2009. Only then did sunlight begin flooding Saturn's northern hemisphere. The view required a change in the angle of Cassini's orbits around Saturn so the spacecraft could see the poles.

## Degree Profile: Statistician

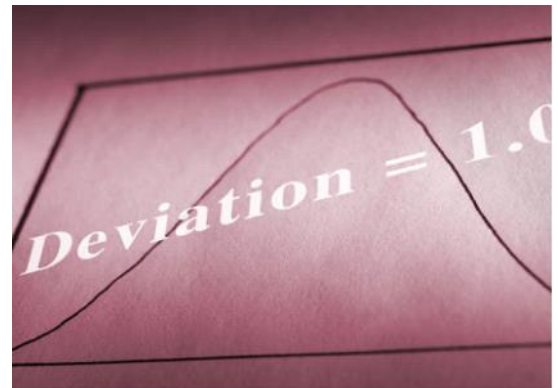
Statistics is the scientific application of mathematical principles to the collection, analysis, and presentation of numerical data. Statisticians contribute to scientific inquiry by applying their mathematical and statistical knowledge to the design of surveys and experiments; the collection, processing, and analysis of data; and the interpretation of the results. Statisticians may apply their knowledge of statistical methods to a variety of subject areas, such as biology, economics, engineering, medicine, public health, psychology, marketing, education, and sports. Many economic, social, political, and military decisions cannot be made without statistical techniques, such as the design of experiments to gain Federal approval of a newly manufactured drug.

Although employment opportunities exist for individuals with a bachelor's degree, a

master's degree in statistics or mathematics is usually the minimum educational requirement for most statistician jobs.

Statisticians hold about 25,100 jobs in the United States. About a third of statisticians work for government, mostly at the federal level. Many statisticians hired by the federal government are known as mathematical statisticians. These workers develop advanced statistical models for several purposes, such as filling in gaps from nonresponses to surveys.

Many statisticians work for private businesses, such as pharmaceutical and insurance companies, and often work in teams with other professionals. For example, in pharmaceutical companies, statisticians may work with scientists to test drugs for government approval. In



insurance companies, they may work with actuaries to calculate the risks of insuring different situations.

According to the U.S. Bureau of Labor Statistics, the median annual wage-and-salary earnings of statisticians is about \$73,000. Employment of statisticians is expected to increase by 14 percent from 2010 to 2020, as fast as the average for all occupations.

Find out more about a career as a statistician at [www.careercornerstone.org](http://www.careercornerstone.org).

## Teen Teams Win Global Innovation Summit

Four teams of high school students received top honors at the 2013 Innovation Summit, the final round of competition for the 2012-2013 Spirit of Innovation Challenge ([www.conradawards.org](http://www.conradawards.org)). Their efforts to create a product or service to benefit humanity earned winning teams a total of more than \$50,000 in cash prizes and awards.



*Spirit of Innovation Challenge finalists celebrate at the 2013 Innovation Summit with program founder Nancy Conrad and Apollo Astronaut Alan Bean. (Image Credit: Conrad Foundation)*

The Conrad Foundation's Spirit of Innovation Challenge celebrates the life and entrepreneurial spirit of astronaut Pete Conrad, third man to walk on the Moon. Presented by Lockheed Martin and Battelle, the annual program is a multi-phase, business and technical plan competition, free and open to students ages 13-18 from around the world. During the course of seven months, students use science, technology, engineering and math skills along with creativity, collaboration and entrepreneurship to develop innovative products and services in one of four categories: Aerospace and Aviation, Cybertechnology and

Security, Energy and Environment, and Health and Nutrition.

This year, 20 finalist teams were selected from a pool of more than 230 entries from 44 countries and throughout the United States to attend the 2013 Innovation Summit. NASA Johnson Space Center (Houston, TX) hosted the April event.

No simple science fair, these young inventors designed products such as an adjustable circular headrest and cushion for airplane seats to allow for maximum comfort during long flights and a suite of electronic detection products which uses international crowd-sourced data to inform the public of dangerous

levels of airborne pollutants. Other teams created a clean, self-sustaining methane production system which stores bio-waste to produce a combustible gas that works as a low-cost energy and heating source, and the Posture Pad, a revolutionary seat pad designed to help people develop better posture habits when using the computer.

For details on all the winning products, visit <http://bit.ly/2013soicwinners>.

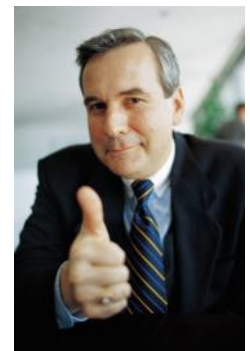
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# NSF Traces Baccalaureate Origins

The National Science Foundation recently released a report detailing the large role played by U.S. research universities in the baccalaureate education of U.S.-trained science and engineering (S&E) doctorate recipients.

Although U.S. research universities are few in number (108 universities are classified as research universities with very high research activity, according to the 2010 Carnegie basic classification), collectively they award a large proportion of U.S. bachelor's degrees each year.

In 2011, the year the latest information is available, 35 percent of individuals earning S&E doctorates from U.S. universities held bachelor's degrees from foreign institutions, and 29 percent earned bachelor's degrees from U.S. doctorate-granting institutions with very high research activity. Of the top 50 U.S. baccalaureate-origin institutions that awarded S&E

doctorate degrees from 2002-2011, all but one are research universities with very high research activity.

Public universities also play a prominent role in the baccalaureate training of U.S. S&E doctorate recipients: approximately two-thirds of the institutions on the top 50 list are public institutions.

The report also looked at the top 10 U.S. baccalaureate-origin institutions for 2002–11 doctorate recipients in each of the four broad subfields of S&E: life sciences, physical sciences, social sciences, and engineering. The public research universities dominate these lists. Of the 18 institutions listed in the report, 12 appear on the top 10 list for multiple broad subfields, and 4 institutions—the University of California, Berkeley; Cornell University; Pennsylvania State University; and the University of Michigan at Ann Arbor—appear on each list. The University of California, Berkeley is the top-

**InfoBrief**  
NCSES National Center for Science and Engineering Statistics  
April 2013 • NSF 13-203

**Baccalaureate Origins of U.S.-trained S&E Doctorate Recipients**  
by Mark K. Fitzgerald and Steven L. Prosser\*

**Foreign institutions and U.S. research universities also play a large role in the baccalaureate education of U.S.-trained science and engineering (S&E) doctorate recipients.** In 2011, about one-third (35%) of individuals earning S&E doctorates from U.S. doctorate-granting institutions with very high research activity held bachelor's degrees from foreign institutions, and 29 percent earned bachelor's degrees from U.S. doctorate-granting institutions with very high research activity. Of the top 50 U.S. baccalaureate-origin institutions that awarded S&E doctorate degrees from 2002-2011, all but one are research universities with very high research activity. Public universities also play a prominent role in the baccalaureate training of U.S. S&E doctorate recipients: approximately two-thirds of the institutions on the top 50 list are public institutions. The report also looked at the top 10 U.S. baccalaureate-origin institutions for 2002–11 doctorate recipients in each of the four broad subfields of S&E: life sciences, physical sciences, social sciences, and engineering. The public research universities dominate these lists. Of the 18 institutions listed in the report, 12 appear on the top 10 list for multiple broad subfields, and 4 institutions—the University of California, Berkeley; Cornell University; Pennsylvania State University; and the University of Michigan at Ann Arbor—appear on each list. The University of California, Berkeley is the top-

**Table 1. S&E doctorate recipients, by 2010 Carnegie classification of baccalaureate institution (2002-11)**

Year	All institutions	Research universities with very high research activity	Research colleges and universities	Baccalaureate colleges	Other 4-year institutions	Unknown
2002	20,000	1,000	7,500	1,000	1,000	7,500
2003	20,017	1,007	7,576	1,007	1,007	7,576
2004	20,034	1,014	7,604	1,014	1,014	7,604
2005	20,051	1,021	7,631	1,021	1,021	7,631
2006	20,068	1,031	7,661	1,031	1,031	7,661
2007	20,085	1,041	7,691	1,041	1,041	7,691
2008	20,102	1,051	7,721	1,051	1,051	7,721
2009	20,119	1,061	7,751	1,061	1,061	7,751
2010	20,136	1,071	7,781	1,071	1,071	7,781
2011	20,153	1,081	7,811	1,081	1,081	7,811
Total	201,000	10,000	75,000	10,000	10,000	75,000

\*Includes top research activity and accreditation categories.  
†Includes research colleges, research colleges, and liberal arts.  
Source: National Science Foundation, National Center for Science and Engineering Statistics, Survey of Doctorate Recipients.

National Science Foundation • Social, Behavioral and Economic Sciences • Help from our statisticians

ranking institution in all three of the science subfields and ranks second in engineering.

College choice can be a daunting decision. Explore a range of careers options and learn about their educational requirements at [www.careercornerstone.org](http://www.careercornerstone.org). The pre-college section has support for making the most of college fairs.

# Top Employers for Engineering Grads

Companies in professional, scientific, and technical services hired the most new college engineering graduates in 2012, according to a new report by the National Association of Colleges and Employers (NACE). NACE's January 2013 Salary Survey found that these employers—who hired for a variety of engineering and software development positions—paid their new engineering hires salaries that averaged \$61,945. "The demand for engineering graduates remains strong, and that is reflected in the high starting salaries paid to these graduates," says Marilyn Mackes, NACE executive director.



Following professional, scientific, and technical services firms were manufacturing employers and government agencies, whose average salaries to new engineering graduates were \$61,146 and \$66,812, respectively. Manufacturing organizations hired new engineering graduates for a variety of engineering and management positions; government agencies hired them for various engineering jobs. Also among the top employers for 2012 engineering graduates were those in educational services (\$58,733), who hired engineering graduates primarily for postsecondary teaching positions, and information (\$67,533), who mostly hired these graduates for jobs as computer programmers. Find out more about salary ranges and career paths in science, technology, engineering, and mathematics at [www.careercornerstone.org](http://www.careercornerstone.org).