



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 Healthcare.

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Year of Science: 2009

In 2009, the world will celebrate the 200th anniversary of Darwin's birth, the 150th anniversary of his publication of *On the Origin of Species*, and the 400th anniversary of the publication of Kepler's first two laws of planetary motion.

To mark these events the American Institute of Biological Sciences, the National Academy of Sciences, and more than 150 other organizations — including the Sloan Career Cornerstone Center — have declared a Year of Science 2009. The goal of this national, year-long celebration of science is to engage the

public and improve public understanding about how science works, why it matters, and who scientists are.

Each month in 2009 is focused around a scientific theme. On the Year of Science 2009 website (www.yearofscience2009.org) are theme - related resources, activities, video clips, podcasts, student challenges, citizen science opportunities, and more.

The Sloan Career Cornerstone Center provides a broad range of career planning information for just about every area of science, and also offers profiles of scientists. Find out what



it is like to work in hundreds of fields, and explore salary levels, educational preparation requirements, and employment trends. Most resources are also available as PowerPoints, PDFs, and podcasts. Find out more at www.careercornerstone.org.

Mathematical Model Predicts Migration

In the coming decades, millions of people will leave their home countries and settle elsewhere. Understanding the patterns of human migration will be crucial to global stability in the 21st century. The growing pace of globalization has increased the level of human migration as individuals and families move from one country or continent to another to escape hardships or seek a better future. The world's future stability

will require the various countries that will lose and receive people to be prepared for this trend.

Joel E. Cohen -- a researcher at Rockefeller University and Columbia University -- and his colleagues have developed a sophisticated mathematical model that gives policy makers a better estimate of which countries and regions will face declining populations and which ones will grow



as people move around the world. The United Nations and other agencies are interested in using this new approach, which is a departure from traditional population modeling. More about careers in mathematics is at www.careercornerstone.org.

Engineering Students Develop Medical Devices

SpineSmith Partners is collaborating with several senior design teams in The University of Texas Biomedical Engineering Department to help educate students on the design, engineering, and commercialization process of medical devices.

The groups of biomedical engineering students will work closely with SpineSmith's product engineers and Ph.D.s to take ideas conceptualized by practicing spine surgeons and design products for commercialization. This design process will educate the students and offer real world experience in

the medical device industry.

SpineSmith is researching and developing the cutting edge market of regenerative medicine giving these students an opportunity to be involved with an evolving market.

SpineSmith is currently researching and developing different technologies utilizing a



patient's own adult stem cells for tissue regeneration in orthopedics and the spine.

With more than 10,000 stem cell cases to date, SpineSmith hopes to revolutionize the regenerative medicine market and give these students an opportunity to make an impact in the product development

process.

Find out more about biomedical engineering careers and others at www.careercornerstone.org.

Degree Profile: Radiologic Technologist

Radiologic technologists take x-rays and administer nonradioactive materials into patients' bloodstreams for diagnostic purposes. They produce x-ray films (radiographs) of parts of the human body for use in diagnosing medical problems. They prepare patients for radiologic examinations by explaining the procedure, removing jewelry and other articles through which x-rays cannot pass, and positioning patients so that the parts of the body can be appropriately radiographed. To prevent



unnecessary exposure to radiation, these workers surround the exposed area with radiation protection devices, such as lead shields, or limit the size of the x-ray beam. Radiographers position radiographic equipment at the correct angle and height over the appropriate area of a patient's body. Using instruments similar to a measuring tape, they may measure the thickness of the section to be radiographed and set controls on the x-ray machine to produce radiographs of the appropriate density, detail, and contrast. They place the x-ray film under



the part of the patient's body to be examined and make the exposure. They then remove the film and develop it. Radiologic technologists should be sensitive to patients' physical and psychological needs.

Two-year associate degree programs are most prevalent for this career path. Radiologic

technologists hold about 196,000 jobs in the United States. More than 60 percent of all jobs are in hospitals. The median annual earnings of radiologic technologists is about \$48,170.

Find out more about a career as a radiologic technologist and other careers in healthcare at www.careercornerstone.org.

Is Coop Key to Female Engineering Student Retention?

Virginia Tech is the co-recipient of a \$499,990 three-year National Science Foundation grant to study how cooperative education and related on-the-job experiences affect female undergraduate engineering students.

The study, Pathways to Work Self-Efficacy and Retention of Women in Undergraduate Engineering, is one of the first to investigate how co-op opportunities and other formal work experience programs impact the retention rate of female



undergraduate engineering students. In addition, the study will examine programs, such as mentoring, advising, and academic living communities, to see how they contribute to self-efficacy and retention.

Coops are available at many accredited engineering programs in the U.S. -- but the range of offerings varies considerably. Some universities offer wide options at many different firms, while others only have a few offerings. It is a good idea to ask about coop options when considering attending a particular university, and also to chat with existing students about their own coop experience.

Over 95 percent of engineering students at Northeastern and all students at the Rochester Institute of Technology participate in cooperative education; while both the University of Wyoming and Virginia Tech do not require the experience, and thus serve as

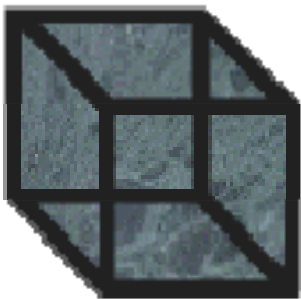


comparison schools for statistical purposes.

Currently, women are underrepresented in engineering. They make up only 18.6 percent of engineering bachelor degree recipients and, in 2006, held only 11 percent of engineering positions.

More information about the research is available at www.coe.neu.edu/pathways. Find out more about coop programs for engineering students at www.careercornerstone.org/coopsint.htm. There are also resources about diversity and for women in STEM on the Sloan Career Cornerstone Center.

Link to the Sloan Career Cornerstone Center



Why not link to the Sloan Career Cornerstone Center from your website? Link to individual pages such as precollege resources, to degree profiles, or to our podcasts or newsletter. We're happy to provide you with a custom graphic or any materials you need!

Find out more at www.careercornerstone.org/addalink.htm

MIT Creates Tiny Backpacks For Cells

MIT engineers have outfitted cells with tiny "backpacks" that could allow them to deliver chemotherapy agents, diagnose tumors or become building blocks for tissue engineering.

The polymer backpacks allow researchers to use cells to ferry tiny cargoes and manipulate their movements using magnetic fields. Since each patch covers only a small portion of the cell surface, it does not interfere with the cell's normal functions or prevent it from interacting with the external environment.

The researchers worked with B and T cells, two types of immune cells that can home to various tissues in the body, including tumors, infection sites, and lymphoid tissues -- a trait that could be exploited to achieve targeted drug or vaccine delivery.

Cellular backpacks carrying chemotherapy agents could target tumor cells, while cells equipped with patches carrying imaging agents could help identify tumors by binding to protein markers expressed by cancer cells.

Another possible application is in tissue engineering. Patches could be designed that allow researchers to align cells in a certain pattern, eliminating the need for a tissue scaffold.

The polymer patch system consists of three layers, each with a different function, stacked onto a surface. The bottom layer tethers the polymer to the surface, the middle layer contains the payload, and the top layer serves as a "hook" that catches and binds cells.



MIT researchers have developed a technique to attach tiny polymer "backpacks" to cells. This immune system cell, a B lymphocyte sports one. The scale bar is 10 micrometers. *Image courtesy / American Chemical Society*

Once the layers are set up, cells enter the system and flow across the surface, getting stuck on the polymer hooks. The patch is then detached from the surface by simply lowering the temperature, and the cells float away, with backpacks attached.

The Next Step in Health Care: Telemedicine

Imagine a scenario where doctors from different hospitals can collaborate on a surgery without having to actually be in the operating room. What if doctors in remote locations could receive immediate expert support from top specialists in hospitals around the world? This environment could soon become a reality thanks to research by a multi-university partnership that is testing the live broadcast of surgeries using the advanced networking consortium Internet2. Rochester Institute of Technology is collaborating with a team led by the University of Puerto Rico School of Medicine that recently tested technology, which allows for the transmission of high quality, real time video to multiple locations. Using a secure, high-speed network, an endoscopic surgery at the University of Puerto Rico was broadcast to multiple locations in the United States. The experiment also included a multipoint videoconference that was connected to the video stream, allowing for live interaction between participants. The team will next conduct additional tests with different surgical procedures and an expanded number of remote locations.

The researchers' goal is to transfer the technology for use in medical education and actual diagnostic applications. More information about careers in medicine and technology are at www.careercornerstone.org.

