



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.

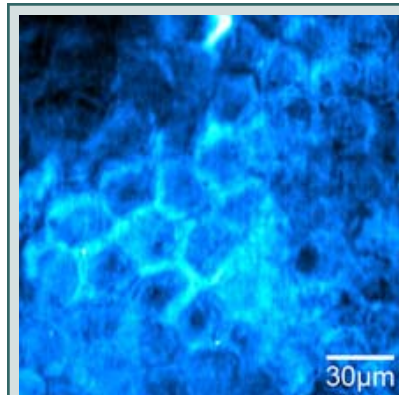
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Next Generation Microscopy

Microscopes have revolutionized the practice of science, especially in the fields of biology and medicine. Imaging techniques remain indispensable to clinicians and researchers who diagnose medical conditions and develop new treatments. Test results can often take hours or even days because cells or tissues must be subjected to lengthy fixation and labeling processes, sometimes called staining, in order to visualize and distinguish cellular components. In addition to long processing times, staining procedures

often include harsh treatments or conditions that alter the tissues themselves, making interpretation of results difficult. A newly developed label-free imaging technique called stimulated Raman scattering (SRS) will likely revolutionize biomedical imaging in laboratories. A team lead by Sunney Xie at Harvard University recently reported a new technique that uses two lasers with different frequencies. Researchers visualize samples by tuning the laser frequencies to match the vibrational frequency of a specific chemical



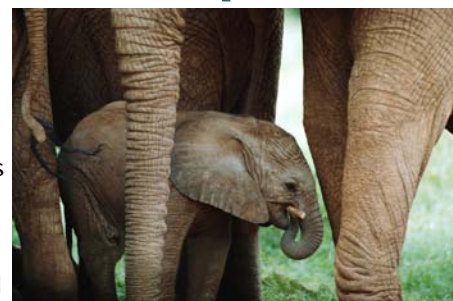
SRS image shows diffusion of retinoic acid (blue), a common drug for acne, through the top layer of the skin, or stratum corneum. Credit: Image Courtesy Harvard University and Pfizer

bond. Each type of molecule within a sample, including nutrients or drugs, is detectable at a unique frequency.

A Shorter Life For Zoo Elephants

People have argued about it for years. Is zoo life really bad for elephants? Are they actually healthier when they roam free? Finally, the debate seems to be over. Researchers have now provided scientific evidence that elephants that roam free are healthier and live longer than those in zoos. This finding answers a lot of questions about the physical and mental health of elephants, and it might also bring about some changes in the world's zoos.

A group of researchers studied data on more than 4,500 elephants – some living in captivity and others roaming free – to find that zoo elephants suffer from many physical and mental ailments. They suggest that being born into a zoo (rather than being imported from the wild), being moved between zoos, and the possible loss of their mothers, all put the animals at particular risk.

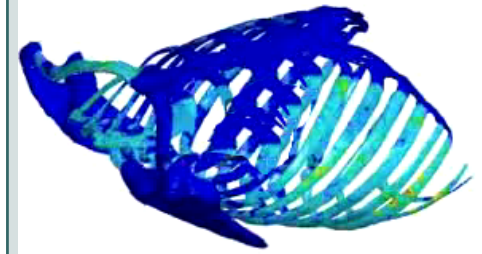


The researchers call for an end to the importation of elephants from their native countries, and they suggest that breeding elephants should be restricted to the zoos that exhibit no harmful effects on their captive-born animals.

Building a Better Dummy

For decades, automakers have been crashing test dummies to gain insight to how various auto safety systems protect – or fail to protect – people during car accidents. But those dummies are made of plastic and steel, not tissue and bone. They can teach only so much. A new generation of dummies will tell a lot more. An international group of automakers and suppliers has formed a Global Human Body Models Consortium to fund the best minds to build a better dummy. A new "virtual" dummy — one that will live entirely within computers — will be more realistic than any physical dummy ever subjected to

a crash test. These will be highly detailed computer dummies – computational models of a full human being – including extreme lifelike detail of the complexities and characteristics of flesh, bones, ligaments, blood vessels and organs. A team at the University of Virginia's Center for Biomechanics will create a realistic computer model of the human thorax and upper extremities, including the ribcage, muscles and ligaments, and the lungs and heart. Teams of researchers at six other universities and institutes will create models of other parts of the human body, including the head, neck and abdomen. All the



University of Virginia engineers will design computational models of the thorax and pelvis regions for an eventual virtual crash test dummy.
Credit: University of Virginia Center for Biomechanics

models will be joined together to create the most sophisticated and lifelike simulation of the entire human body ever assembled for safety testing.

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

Degree Profile: Environmental Engineering

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 scientific 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.

A bachelor's degree in engineering is required for almost all entry-level engineering jobs. Accredited environmental engineering programs usually provide broad studies in the physical, chemical, and biological sciences in addition to course work in civil, mechanical, and/or chemical engineering.

Environmental engineering technologists work closely with environmental engineers and



scientists in developing methods and devices used in the prevention, control, or correction of environmental hazards. Preparation for technologist positions is usually an associate degree offered through community colleges. More info about careers in environmental engineering is at www.careercornerstone.org.

Student Develops Pocket-sized Ultrasound Device

A prototype of a therapeutic ultrasound device, developed by a Cornell graduate student, fits in the palm of a hand, is battery-powered and packs enough punch to stabilize a gunshot wound or deliver drugs to brain cancer patients. It is wired to a ceramic probe, called a transducer, and it creates sound waves so strong they instantly cause water to bubble, spray and turn into steam.

Tinkering in his Olin Hall lab, George K. Lewis, a third-year Ph.D. student in biomedical engineering and a National Science Foundation fellow, creates ultrasound devices that are smaller, more powerful and many times less expensive than today's models. Devices today can weigh 30 pounds and cost \$20,000; his is pocket-sized and built with \$100. He envisions a world where therapeutic ultrasound machines are found in every hospital and medical research lab.

Ultrasound is commonly used as a nondestructive imaging technique in medical settings. Sound waves, inaudible to humans, can generate

images through soft tissue, allowing, for instance, a pregnant woman to view images of her baby. But the higher-energy ultrasound that Lewis works with can treat such conditions as prostate tumors or kidney stones by breaking them up. His devices also can relieve arthritis pressure and even help treat brain cancer by pushing drugs quickly through the brain following surgery.

Lewis suggests that his technology could lead to such innovations as cell phone-size devices that military medics could carry to cauterize bleeding wounds, or dental machines to enable the body to instantly absorb locally injected anesthetic.

Lewis miniaturized the ultrasound device by increasing its efficiency. Traditional devices apply 500-volt signals across a transducer to convert the voltage to sound waves, but in the process, about half the energy is lost. In the laboratory, Lewis has devised a



George K. Lewis with his newest portable ultrasound device.

Image Source: Cornell University; Robert Barker/University Photography

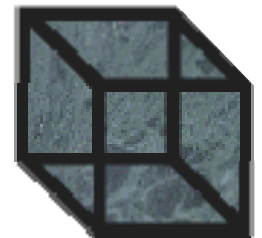
way to transfer 95 percent of the source energy to the transducer.

More information is available at www.bme.cornell.edu.

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

Our Partner Organizations Include:

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- American Institute of Chemical Engineers
- American Institute of Physics
- American Mathematical Society
- American Nuclear Society
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- Society of Actuaries
- The Minerals, Metals, and Materials Society
- US Department of Labor, Bureau of Labor Statistics
- Whitaker Foundation



Find out how your organization can be a partner at www.careercornerstone.org

Biologist Profile: Angela Benson-Grier

The Sloan Career Cornerstone Center offers profiles of hundreds of professionals in many fields so students, counselors, and others can see what it might be like to work in different fields. Profiles include information about educational preparation, what an average day is like, what they've done that they've enjoyed them most, and their advice for students considering a career in their area.

A good example is the profile of Fisheries Research Biologist, Angela Benson-Grier. Angela works at the Indiana Department of Natural Resources where she is responsible for conducting fisheries research projects in glacial lakes located in the northern half of Indiana. When asked when she first knew she wanted to be a biologist, Angela says, "I knew I wanted to be a marine biologist in 9th grade. As I grew and learned more about the

field, I learned more about where my specific interests were focused." Angela earned a bachelor's degree in Fisheries, and then went on to earn a Master's degree in Fisheries and Aquatic Sciences. She says that the best thing about being a biologist is that she is "part of a collection of individuals that work together to create changes that will better protect our environment and better manage the resources we have left." When asked where she sees biology careers heading in the future, she explained, "I see biologists in the future doing the same things we do now – finding ways to protect and manage the resources we have available. I see the need for well-trained and diversely-trained biologists in the future being even more critical than it is today. Multi-disciplinary collaborative research projects are important. The better connected a



student is through a professional society not only in their own field, but also related fields, will afford them more opportunities for jobs and funding in the long run." Her advice to students? "Find what you are truly passionate about because passion will help make you successful in whatever it is you choose to do."

Explore other profiles at www.careercornerstone.org/profiles.htm.

Hiring Prospects and Strategies for Success



Employers say they will hire about as many new college graduates from the Class of 2009 as they did from the Class of 2008, but plan to keep a watchful eye on those hiring needs, so they can shift gears if necessary, according to a report from the National Association of Colleges and Employers (NACE). Among employers responding to NACE's Job Outlook 2009 survey, the largest group (26) said they will reassess their college graduate hiring needs on a monthly basis. That's a change from last year when 26 percent said they would reassess quarterly. In more challenging hiring environments, it is important to make use of all the resources online and at university or community college career centers. Most career centers offer career counseling; resume writing, interviewing skills, and other job-search related workshops; programs to help students identify and connect with potential employers, such as career fairs and on-campus interviews; and job postings from interested employers, among other services. The Sloan Career Cornerstone Center (www.careercornerstone.org) offers career planning tips, profiles of professionals working in hundreds of fields, and career path summaries for over 170 fields, including employment and earnings summaries.