



# 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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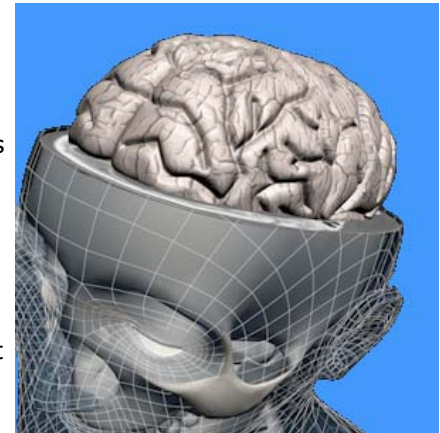
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## Exploring Synthetic Brains

Synthetic brains are a long way from reality, but researchers at the University of Southern California, funded by the National Science Foundation, are taking the first steps to build neurons from carbon nanotubes that emulate human brain function. The challenges to creating a synthetic brain are staggering. Unlike computer software that simulates brain function, a synthetic brain will include hardware that emulates brain cells, their amazingly complex connectivity and a concept called "plasticity," which allows the artificial neurons to

learn through experience and adapt to changes in their environment the way real neurons do.

There is also the matter of scale. By 2022, with conventional technology, if the team could construct a synthetic brain that emulated real brain function, even crudely, it would take 100 billion artificial neurons and a very a large room to hold them. But before the researchers can tackle concerns of power and scale, they are building mathematical models that accurately reflect the



connections of all the neurons and demonstrate how the connections allow neurons to communicate with each other.

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

## HIV Treatment Test Gains Support

An initiative that is developing a rapid and inexpensive test to analyze the immune system of people living with HIV/AIDS has received a \$7.3 million grant from the Bill & Melinda Gates Foundation. If successful, the test would improve healthcare workers' ability to determine the best treatment for their patients. The CD4 Initiative at Imperial College London was established to develop an easy to use point-of-care test with a cost of around

\$2 that can rapidly measure the numbers of CD4+ T-cells in a person's blood, without using electronics or mechanical parts. CD4+ T-cells are critical for a healthy functioning immune system and are slowly destroyed during the course of HIV infection. When the numbers of CD4+ T-cells in a person's blood drop, this makes them increasingly vulnerable to illness. Healthcare workers rely on a CD4 count when making decisions about how HIV-positive patients



should be treated. The new test would enable patients to find out within minutes if they should begin antiretroviral treatment. The new test will work with a finger-prick blood sample and will have a simple read-out. More details are at [www.imperial.ac.uk](http://www.imperial.ac.uk)

## 360 Look at ASIMO Robot's Technology

Honda is offering a 360 degree view of the technology behind its ASIMO humanoid robot at <http://asimo.honda.com/InsideAsimo.aspx>. ASIMO's form, function, movement and intelligence are detailed in the new website module which uses a 3D computer-generated model of the robot to provide visitors with a more informative and interactive look at ASIMO's capabilities and how it operates.

ASIMO, which stands for Advanced Step in



Innovative Mobility, is being developed to help people and someday assist the elderly and disabled in their homes. But while Honda continues to develop and enhance ASIMO's capabilities, the robot is being used today to encourage and inspire young students to consider studies in math and science. Honda engineers began developing a humanoid robot in 1986 with the dream of creating a new dimension in mobility. By having a robot provide assistance to people, they envisioned

that this could enable those people to be more mobile to pursue other activities.

ASIMO is the culmination of two decades of humanoid robotics research by Honda engineers. ASIMO can run, walk on uneven slopes and surfaces, turn smoothly, climb stairs, and reach for and grasp objects. ASIMO can also comprehend and respond to simple voice commands. ASIMO has the ability to recognize the face of a select group of individuals. Using its camera eyes, ASIMO can map its environment and register stationary objects. ASIMO can also avoid moving obstacles as it moves through its environment.

## Degree Profile: Psychology

Psychologists study the human mind and human behavior. Research psychologists investigate the physical, cognitive, emotional, or social aspects of human behavior. Psychologists in health service fields provide mental health care in hospitals, clinics, schools, or private settings. Psychologists employed in applied settings, such as business, industry, government, or nonprofit organizations, provide training, conduct research, design organizational systems, and act as advocates for psychology.

Like other social



scientists, psychologists formulate hypotheses and collect data to test their validity. Research methods vary with the topic under study. Psychologists sometimes gather information through controlled laboratory experiments or by administering personality, performance, aptitude, or intelligence tests. Other methods include observation, interviews, questionnaires, clinical studies, and surveys.

Psychologists apply their knowledge to a wide range of endeavors, including health and human services, management, education, law, and sports. They usually specialize in one of a number of different areas.

As an example,

experimental or research psychologists work in university and private research centers and in business, nonprofit, and governmental organizations. They study the behavior of both human beings and animals, such as rats, monkeys, and pigeons. Prominent areas of study in experimental research include motivation, thought, attention, learning and memory, sensory and perceptual processes, effects of substance abuse, and genetic and neurological factors affecting behavior.

A master's or doctoral degree, and a license, are required for most psychologists. The Sloan Career Cornerstone Center offers more information on psychology at [www.careercornerstone.org/psychologist/psychologist.htm](http://www.careercornerstone.org/psychologist/psychologist.htm).

## Scientists Invent World's Smallest Periscope

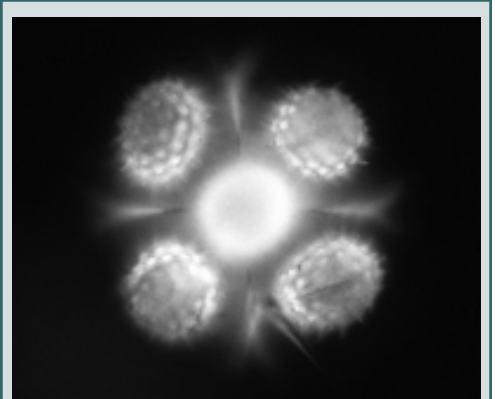
A team of Vanderbilt University scientists have invented the world's smallest version of the periscope and are using it to look at cells and other micro-organisms from several sides at once.

"With an off-the-shelf laboratory microscope you only see cells from one side, the top," says team member Chris Janetopoulos, assistant professor of biological sciences. "Not only can we see the tops of cells, we can view their sides as well – something biologists almost never see." The researchers have dubbed their devices "mirrored pyramidal wells." As the name implies, they consist of pyramidal-shaped cavities molded into silicon whose interior surfaces are coated with a reflective layer of gold or platinum. They are microscopic in dimension – about the width of a human hair – and can be made in a range of sizes to view different-sized objects. When a cell is placed in such a well and viewed with a regular optical microscope, the researcher can see several sides simultaneously.

"This technology is exciting because these mirrored wells can be made at very low cost, unlike other, more complex methods for 3D microscopy," says Assistant Professor of the Practice of Biomedical Engineering Kevin Seale.

The Vanderbilt group is not the first to make microscopic pyramidal wells, but it is the first to apply them to make 3D images of microorganisms. In 2006, a group of scientists in England created pyramidal micromirrors and applied them to trapping atoms. And last spring researchers at the National Institute of Standards and Technology used similar structures to track nanoparticles.

So far, the researchers have used the mirrored wells to examine how protozoa swim and cells divide. "The method is particularly well suited for studying dynamic processes within cells because it can follow them in three dimensions," says Janetopoulos. The mirrored pyramidal wells



Fluorescent image of a grain of sunflower pollen taken with a mirrored pyramidal well shows four sides and top at the same time.

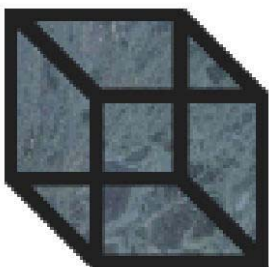
(Credit: Kevin Seale, VIBRE)

provide a high resolution, multi-vantage-point form of microscopy that also makes it easier for researchers to measure a number of important cell properties.

More details are at the Vanderbilt Institute for Integrative Biosystems Research and Education website at [www.vanderbilt.edu/viibre](http://www.vanderbilt.edu/viibre).

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

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## "Green Economy" Could Create "Green Jobs"

A new study on the impact of an emerging global "green economy" on the world of work says efforts to tackle climate change could result in the creation of millions of new "green jobs" in the coming decades. The report, "Green Jobs: Towards Decent work in a Sustainable, Low-Carbon World," says changing patterns of employment and investment resulting from efforts to reduce climate change and its effects are already generating new jobs in many sectors and economies, and could create millions more in both developed and developing countries. The report says that climate change itself, adaptation to it and efforts to arrest it by reducing emissions have far-reaching implications for economic and social development, for production and consumption patterns and thus for employment, incomes and poverty reduction. These implications harbor both major risks and opportunities for

working people in all countries.

Among other key findings in the report:

- The global market for environmental products and services is projected to double from US\$1,370 billion (1.37 trillion) per year at present to US\$2,740 billion (2.74 trillion) by 2020, according to a study cited in the report.
- Half of this market is in energy efficiency and the balance in sustainable transport, water supply, sanitation and waste management.
- Sectors that will be particularly important in terms of their environmental, economic and employment impact are energy supply, in particular renewable energy, buildings and construction, transportation, basic industries, agriculture and forestry.
- Clean technologies are already the third largest sector for venture



capital after information and biotechnology in the U.S.

- A worldwide transition to energy-efficient buildings would create millions of jobs, as well as "greening" existing employment for many of the estimated 111 million people already working in the construction sector.
- Investments in improved energy efficiency in buildings could generate an additional 2-3.5 million green jobs in Europe and the U.S. alone.

The link to the report is at [www.careercornerstone.org](http://www.careercornerstone.org).

## Attributes of the Perfect Job Candidate

A new study by the National Association of Colleges and Employers (NACE) shows that, for new college graduates in this tight economy, becoming the perfect job candidate requires diversity of skills. Nearly 70 percent of employers taking part in NACE's Job Outlook 2009 study said they screen candidates by GPA (grade point average). Among the skills, attributes, and qualities employers prize most are communication skills, a strong work ethic, ability to work in a team, and initiative. Employers also emphasize leadership experience. Asked to compare two otherwise equally qualified candidates, employers chose the one who had held a leadership position over the candidate who simply was involved in extracurricular activities. Employers also expressed a preference for candidates with relevant work experience. So coops or work experiences in the field can have an impact on how appealing a student is to a potential employer. The Sloan Career Cornerstone Center has additional resources on coops and internships at [www.careercornerstone.org/coopsint.htm](http://www.careercornerstone.org/coopsint.htm).

