

# Bulletin of the

CONNECTICUT ACADEMY OF SCIENCE AND ENGINEERING



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## Connecticut Center for Advanced Technology: 'A Springboard of Technological Innovation'

With today's razor-thin cell phones and palm-sized MiniPods, one might forget that leading-edge technology can come in giant packages—like the 7 1/2-ton shipment that Karl Prewo and his team are awaiting. Due to arrive this summer from Europe, the high-precision, high-speed laser micromachining system marks the newest addition to the laser applications lab that Prewo helped build at the Connecticut Center for Advanced Technology in East Hartford, where he is chief of innovation and technology.

The first of its kind in the United States, this ground-breaking laser is part of an arsenal of technology and expertise that CCAT has amassed over the past two years in its quest to position Connecticut industry at the forefront of economic competitiveness.

"Our business is to strengthen the region's capabilities through technology," said Prewo, a metallurgist with 58 patents who previously served as director of integrated materials, design and manufacturing programs at the United Technologies Research Center. "That means businesses need to have the best technology available. They have to have the people who know how to apply and further it. And they need to use it to become even better at what they do."

For CCAT, serving as a springboard of technological innovation is no idle resolution. Since establishing itself as an independent, non-profit corporation in 2004, CCAT has marshaled an array of state- and federally-funded programs—including a \$41 million national aero- (See CCAT page 2)

## Science Center Gets A New Name and A New Look!

The Connecticut Center for Science & Exploration has adopted a new name—Connecticut Science Center—and an exciting new logo. The new logo is a stylized profile of some of the signature lines of the Connecticut Science Center's building, which is now under construction.



### Campaign Grows

The Center has raised more than \$139 million and has received pledges reaching 93% of its \$150 million goal. Leading new gifts have recently been announced from St. Paul Travelers, WFSB TV, The Hartford Foundation for Public Giving, Bristol Myers-Squibb, MassMutual, and AlphaGraphics.

### New Exhibit Details

The Center's exhibit design team unveiled exhibit gallery layouts and designs of some of the 200+ exhibits now in development. The Children's Gallery, Space Science Gallery and Earth Science Gallery were among the many unveiled. The Children's Gallery features a series of stream channels, vortex pools, and a mist fountain for experiments with forces and properties found in nature. Inside the Space Science Gallery visitors will "fly over" Mars in a joystick-equipped flight chair, surrounded by dramatic images of Mars from recent missions. The Earth Science Gallery contains the WFSB Weather Exhibit where visitors will use temperature and wind readings from the Center's Roof Garden to create a weather forecast and deliver it "on TV" like a meteorologist.

### Leading Executives Join

The Center enthusiastically welcomed three prominent executives to their positions as members of the Center's Board of Trustees: Dona Young, chairman, president and CEO of the Phoenix Companies; Ronald Williams, CEO and president of Aetna; and Peyton Patterson, chairman, president and CEO of NewAlliance Bank.

## News from the National Academies

The following is excerpted from press releases of the National Academies and from *Infocus Magazine*, a news resource of the National Academies, which can be found online at [www.infocusmagazine.org](http://www.infocusmagazine.org).

### ◆ US Should Take Lead in Particle Physics Research

To remain globally competitive in the field of particle physics, the United States should take the lead in worldwide research efforts that would answer critical questions about the constituents of matter and the forces that govern them, as well as the composition and evolution of the universe, according to a new report from the National Research Council. The report recommends that the United States participate in major international particle physics projects and announce its desire to be the host country for the next state-of-the-art particle accelerator.

The nation's contribution to particle physics for the past 50 years has led to very detailed knowledge of the basic constituents of matter and how they interact with each other, as well as to a deeper understanding of the universe and the discovery of new particles. The report states that the key to continued US leadership will be the aggressive pursuit of several key experiments that require accelerators. The world's most powerful accelerator, located at the Fermi National Accelerator Laboratory in Batavia, Illinois, will be shut down by 2010. An accelerator capable of operating at higher energies, the Large Hadron Collider (LHC), is being assembled in Geneva and will start operating in 2007, and physicists around the world are planning to build an even more powerful one, the International Linear Collider (ILC).

The US government should support the nation's involvement in both the LHC and the future ILC in conjunction with the newly proposed American Competitiveness Initiative's commitment to strengthen US global leadership through continued technological advances. The government

(See National Academies, page 7)

space competitiveness venture—directed at advancing the state’s leadership in technology, entrepreneurialism and education.

Because these three areas are as essential as they are interconnected, CCAT’s founders concluded that each needed to be addressed synergistically to have far-reaching, sustained impact. Similarly, CCAT recognized early on that to best realize its role as a stimulus for technology-led growth, it could not act alone. Consequently, CCAT has reached out to businesses, government and academia, encouraging a cross-pollination of technology and ideas.

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“The region can’t just rely on companies to do it on their own,” Prewo said. “We are challenged by greater competition among states, among regions, among countries. So regions have to identify their strengths and then capitalize on them to attract and keep good people and companies. And you need government, academia and industry aligned in the same direction, working together for a common purpose.”

Those technologies on which CCAT focuses revolve around the region’s historic and evolving strengths, spanning manufacturing, energy technology, aerospace and defense, biotechnology and nanotechnology.

Promoting these strengths was a major impetus for CCAT’s formation. It grew out of the vision that Congressman John B. Larson, (1st Congressional District), originally held for a science and technology park emerging as a national center of excellence.

With Larson’s backing, CCAT has taken a significant step in that direction. It is home to the recently-formed National Aerospace Leadership Initiative (NALI). Funded by the US Air Force, NALI is a multi-state consortium of government, industry and university leaders concentrated on preserving the superiority of the US aerospace industry throughout its supply chain, from the one-shop manufacturer to the multi-billion-dollar defense contractor. Its goal is security—national and economic—Larson said.

“A strong economic-development effort is needed to combat numerous challenges that Connecticut and the region currently face, most notably the continued loss of manufacturing jobs, as well as new challenges that we will meet in the future, some of which come from overseas competition,” Larson said. “Our continued economic performance depends on our ability to pioneer the manufacturing technologies of the future and remain at the cutting edge of collaboration and technological innovation. This means our industry and workforce must remain leaders in the aerospace and defense fields while at the same time ensuring that emerging fields such as fuel cells, nanoscience and advanced laser and photonics technology become major parts of our economic fabric.”

CCAT’s applied-research labs in laser applications and in digital modeling and simulation exemplify the relationships that CCAT has woven to spur the region’s economy forward. The labs serve as the core of its Innovation Center, currently located in space leased from the United Technologies Research Center. In addition to the labs, the Innovation Center also provides incubator resources for startup technology companies that complement CCAT’s activities.

At its laser applications lab, CCAT engineers are working with the military and contractors to develop faster, more exact manufacturing processes such as high-precision drilling, machining and welding. Other manufacturers are benefiting as well. For example, last fall CCAT hosted its first laser hole drilling conference, attracting international participants to Hartford. Recently, the lab helped a Connecticut medical-devices manufacturer rectify a flaw that risked delaying 600,000 units slated for delivery. Sharing its knowledge with area colleges and universities, CCAT is helping to create advanced technology programs, including a new master’s degree concentration in laser engineering at the University of Hartford.

Meanwhile, finishing touches are being made at the modeling and simulation lab for a virtual three-dimensional factory. Modeling and simulation—the use of sophisticated software that allows the cycle of engineering design and manufacturing operations to be done on computer—will also serve as a resource for businesses and academia. Students and professors around the region are participating in research and industry projects through CCAT’s labs.

(See CCAT, page 8)

# IN BRIEF

## Science and Engineering Notes from Around Connecticut



### Business & Industry

**CANCER CENTER A GO IN NEW HAVEN.** Yale-New Haven Hospital is going ahead with plans to build a new cancer center after striking a landmark deal with city and labor union leaders that will provide voluntary tax payments to the city, bring jobs and job training to residents of the neighborhood and possibly pave the way for 1,800 health care workers to unionize. Originally established in 1974, the **Yale Cancer Center** was one of the first university-based comprehensive cancer centers designated by the National Cancer Institute. It currently is the only center with this designation in southern New England. In collaboration with **Yale School of Medicine** and **Yale-New Haven Hospital**, construction is now underway on a new, 14-story, \$430 million facility, which is expected to be completed in 2009.

**DRUG FIRMS TO MERGE.** Pharmaceutical and chemical company **Bayer AG** has made a \$19.5 billion offer for Schering AG, whose management said it would accept the offer over a hostile bid from Merck KGaA. In a statement, Bayer, whose North American pharmaceuticals division is based in **West Haven**, said the deal would create a "heavyweight of international rank" with some \$10.8 billion in sales a year.

**'KEEP 'EM FLYING.'** A local manufacturer of gears for jet engines and helicopters has won an \$11 million contract from the Army to help keep older aircraft flying. Under the three-year contract, **Aero Gear Inc.** will design and build replacement gearboxes and other parts for engines used by many aging military planes and helicopters. For example, some work will be done for the TF33 turbofan engine, built by **Pratt & Whitney** between 1959 and 1985. That engine powers older planes, including the B-52 bomber and K-135 Stratotanker. Military aircraft that have been in service for decades can be grounded because of a lack of spare parts, either because the original manufacturers no longer make such parts or because they have gone out of business.

**NEW COMPANY HAS A LEG UP.** A new company, **Vascular Insights, LLC**, was founded to develop, manufacture and market devices to treat varicose vein disease, based on technology invented by **Michael Tal**, assistant professor of diagnostic radiology and director of research interventional radiology at the **Yale School of Medicine**. Vascular Insights is developing a simplified procedure using a single, disposable product for elimination of varicose veins. The company believes the product will eliminate the need for anesthesia, hospitalization or surgery, and cause less damage to surrounding tissue and nerves, resulting in reduced convalescence, fewer complications and less pain for patients.

**NEW HAVEN ON RADAR SCREEN.** An analysis of the nation's biotech centers by **Yale University's Office of New Haven & State Affairs** shows that the New Haven region has one of the leading biotechnology clusters in the United States and that it commercializes research at a faster rate than several much larger metropolitan areas. "New Haven biotech is remarkably efficient at commercializing research," said **Jon Soderstrom**, managing director of the **Yale Office of Cooperative Research**. The growth in biotechnology research and commercialization has been fueled by the fast growth in university spin-offs, including more than 20

Yale-related companies and two companies emerging from the **University of Connecticut**.

**MUSHROOMING BUSINESS.** As a research scientist interested in developing new drugs from natural sources, **E. Edward Mena** has worked with spider venom and the lethal toxins of cone snails. Mena, the president of **LifePharms Inc.**, has now turned his attention exclusively to mushrooms. Mena hopes that his vast collection of mushrooms—actually extracts from mushrooms—will create a prosperous business. In one study looking for a smallpox vaccine, Mena and his collaborators are screening for chemicals that will somehow inhibit the virus. In a cancer study, they're looking for substances that will act on cancer cells, but won't damage healthy cells. His goal is to maintain a library of chemicals that will attract drug companies who are interested in collaboration, or in licensing compounds, paying fees for services, or paying royalties as drugs are developed.

**YALE STARTUP AN SBIR SUCCESS STORY.** A startup company that began at **Yale University** and is focused on neurological, psychiatric and pain disorders, was a featured success story at the **Connecticut Small Business Innovation Research (SBIR) BioScience Event** held this past April. In October 2005, **Marinus Pharmaceuticals, Inc.**, raised \$29.4 million through venture capital companies and private investors. Marinus also recently received an SBIR grant from the National Institutes of Health. The Connecticut SBIR Office assists small science and technology companies to compete for \$100,000 to \$750,000 in federal research and innovation grants under its \$2 billion SBIR program. The Connecticut SBIR Office is part of the **Connecticut Center for Advanced Technology (CCAT)** and funded through the state's **Office for Workforce Competitiveness**. Its services are free.



### Communication

**WEEKLY RADIO PROGRAM TO AIR.** The **Yale Cancer Center** is broadcasting "Healthline," a weekly radio program that airs from 8:30-9:00 am every Sunday on WTIC NewsTalk 1080 AM. "Healthline" is co-hosted by **Kenneth Miller**, director of the survivorship program and **Edward Chu**, chief of medical oncology at the center. Each week, they will be joined by a different cancer specialist. "Healthline was created to provide patients and their families with help and hope to sustain them in their fight against cancer," said Miller.



### Education & Cognition

**YALE WELCOMES YOUNG SCIENTISTS.** Hundreds of local science students exhibited their work at **Yale University** during the New Haven Public Schools' 12th annual **Olin-Yale-Bayer New Haven Public Schools Science Fair** in March. Projects included a study of boats and navigation, and an examination of how birds react to different species' contact calls. One entry asked, "Rust: Can We Save the Tin Man?" Another considered an herbal cure for cancer, using fruit flies with tumors. The Science Fair is co-sponsored by **Yale, Olin Corporation, Bayer Healthcare, the Connecticut Pre-Engineering Program** and the **New Haven** public schools. The Science Fair encourages student achievement

*Items that appear in the In Brief section are compiled from previously published sources including newspaper accounts and press releases. For more information about any In Brief item, please call the Academy at (860) 527-2161, write the editors at CASE Bulletin, 179 Allyn St., Suite 512, Hartford, CT 06103-1422, or email us at acad@ctcase.org*



# IN BRIEF

## Science and Engineering Notes from Around Connecticut

through independent research and stimulates students to consider careers in math and science.

**CBIA, PFIZER TEAM UP FOR SCHOLARSHIPS.** The **Connecticut Business & Industry Association (CBIA)**, and **Pfizer Global Research and Development** are, for a second year, providing undergraduate fellowship programs to students at eight area colleges and universities. CBIA and Pfizer are working with the **University of Connecticut, Central Connecticut State University, Fairfield University, Trinity College, Worcester Polytechnic Institute** and **The College of the Holy Cross**. Two new universities have been added to the program this year: the **University of New Haven** and the **University of Hartford**. According to **Judith Resnick**, CBIA director of workforce development and training, "Colleges and universities are realizing the benefits of the fellowship program and want to provide their students with this extra curriculum, which allows them to get the hands-on research skills necessary to pursue a career in the pharmaceutical industry."

**'STARS' SHINE AT YALE.** For 10 years, the STARS (Science, Technology and Research Scholars) program at **Yale University**, supported by **Boehringer Ingelheim Pharmaceuticals, Inc. (BIPI)** and the **Howard Hughes Medical Institute (HHMI)**, has provided Yale students with an integrated experience in research, course-based study and development of mentorship skills. STARS identifies and supports students in Yale's natural sciences and engineering majors who come from backgrounds traditionally underrepresented in science, including racial and ethnic minorities, women and physically challenged students.

**ROBOTICS COMPETITION.** In an atmosphere akin to a professional wrestling match, 40 teams from area high schools gathered at the Connecticut Convention Center in April to compete in the **United Technologies New England Regional of the FIRST Robotics Competition**, founded by engineer, inventor and **Connecticut Science Center** board of trustees member **Dean Kamen**. One Connecticut team—the **Cyber Knights** from **Southington High School**—went on to place second out of 344 teams at the national FIRST competition. The program encourages young people to think like scientists and engineers while working to create a robot to compete in a game designed by the organizers. But the program is about more than having one robot outmaneuver another. Just ask **Eddie Rodriguez**, a 2000 graduate of **Hartford Public High School**, who is now a mentor. "It changed my life completely," said Rodriguez, who was a mediocre student before joining the program. He went on to college, and is now an engineer at **Pratt & Whitney**.

**A HUNGER TO LEARN.** A team of **Yale** scientists have found that a hormone produced in the stomach directly stimulates parts of the brain involved in learning and memory. The hormone, ghrelin, is produced in fat cells and circulates mostly during daylight hours whenever the stomach is empty. The scientists found that in mice, ghrelin directly stimulates activity in the hippocampus, an area of the brain crucial to enhanced learning and memory. And mice with enhanced levels of ghrelin performed better on learning and memory tasks than other mice. Evidence suggests that learning might be best accomplished on an empty stomach, said **Tamas L. Horvath**, associate professor of neurobiology, comparative medicine, obstetrics, gynecology and reproductive sciences.

**FUTURE SCIENTISTS MEET AT UCONN SYMPOSIUM.** **Diana Wohler** of Glastonbury is so fascinated with neuroscience that she helped construct a gene for use in memory experimentation with laboratory mice. **Andrew Taylor** of Newtown analyzed

hundreds of *Fundulus heteroclitus*, also known as mummichogs, to compare the ecological health of two sections of Long Island Sound. **And Jennifer Curtis** of East Hartford studied how different storage methods affect the rate at which lycopene, a powerful antioxidant, diminishes in fruits and vegetables. The three were among about 160 high school students who took part in a two-day regional **Junior Science and Humanities Symposium at the University of Connecticut**. The symposium is designed to promote research and experimentation in the sciences, mathematics and engineering at the high school level.

**CALCULATORS + TESTS = MONEY.** In an effort to keep up with wealthier schools, urban districts have spent thousands of dollars to equip their students with a common piece of technology—calculators. The state requires that students use calculators on parts of the Connecticut Mastery Test and the Connecticut Academic Performance Test. While students in wealthy districts can afford feature-packed calculators that allow them to work more quickly, students in poorer cities rarely have their own calculators at school. As a result, less wealthy districts such as **New Britain, Hartford** and **Waterbury** have spent extra money to buy calculators with bigger screens and more functions, so that their students are equipped as well as their counterparts in wealthier districts.



## Energy

**PUTTING NEW ENERGY INTO CLEAN POWER.** With the goal of creating a market for clean energy that eventually will make it more affordable than using fossil fuels, Connecticut has assembled a collaborative of government, nonprofit, business and private programs. Its underpinning is state law that requires and promotes clean-energy use. So far, more than 7,100 electricity users have signed up in about 11 months for the **Clean Energy Option**, a program mandated by the state and run by its two largest electric utilities to offer clean energy to residents. Another program has commitments from more than 20 cities and towns to buy 20% of their power for municipal buildings from clean energy sources by 2010, and another several dozen are considering signing on. Clean energy sources include wind, hydroelectric plants and methane gas collected from landfills.

**POWERFUL INCENTIVES.** The state **Department of Public Utility Control** has announced a new program that offers grants and loans for generation systems installed by factories, office buildings, hospitals, malls, hotels, convention centers and condominium complexes. Grants are available for power systems of as much as 65 megawatts in capacity. There is no minimum size. The agency said that having businesses and other electricity users invest in their own generating systems will add badly needed capacity to Connecticut's power grid.

**CL&P WILL REMOVE POLE-TOP DEVICES.** **Connecticut Light & Power Co. (CL&P)** plans to spend \$4.5 million a year over the next three years to remove every A.B. Chance porcelain cutout from its system. CL&P's decision to remove the A.B. Chance porcelain cutouts came about during a state **Department of Public Utility Control** investigation into the performance of such devices and a fire that destroyed a Dunkin' Donuts restaurant on Route 4. Cutouts are protective devices placed on utility systems that halt the flow of electricity if there is a surge, protecting transformers and other equipment the same way a circuit breaker protects a home. A.B. Chance, a division of Orange-based **Hubbell Inc.**, is one of the largest suppliers of cutouts to electric utilities.

# IN BRIEF

## Science and Engineering Notes from Around Connecticut



### Environment

**JAPANESE TECHNIQUES FUELING GROWTH.** At an Eastford plant where sheet metal has been turned into aircraft parts since 1960, aerospace manufacturing firm **Whitcraft LLC** is aggressively applying “lean manufacturing” techniques. Company president **Jeffrey Paul** and his partner and best friend, **Colin Cooper**, describe it as a shift not just in operations, but also in the company’s culture. The “lean” philosophy, developed by Toyota Motor Co., has revolutionized manufacturing around the world. It has been adopted by major US manufacturers, including United Technologies Corp. “Going lean” involves a relentless effort to cut waste while striving for continuous improvement. Instead of building a backlog of inventory, lean companies adhere to a “just-in-time” ethic by which orders are finished and shipped immediately.

**‘GREEN’ CAMPUSES.** From using soybean oil diesel fuel to heat dorms to teaching courses on sustainable energy, the state’s colleges and universities are finding creative and cutting-edge ways to promote environmentalism in a trend that is sweeping college campuses nationwide. Many colleges, including the **University of Connecticut** and **Connecticut College**, have hired directors to shape their campus’ environmental policies. In some cases, college presidents are engaged. Yale University president **Richard Levin** has pledged to develop an aggressive strategy to reduce greenhouse gases generated by the university by 10%.

**STUDENTS HELP YALE TO GO GREEN.** In an effort to raise awareness and begin curbing emissions, **Yale University** challenged students to reduce energy use in the university’s twelve residential colleges by 15% over three years. For every 5% reduction, the university promised to allocate renewable energy certificates (RECs) to offset one-third of the electrical energy used by residential colleges. RECs represent energy produced by renewable sources such as solar, wind, biomass or hydroelectric that is fed into the grid in place of energy produced by coal or other fossil fuel-based sources. Yale students managed to reduce energy needs by 10% in the first year of the challenge, so the university will buy cleaner energy to offset two-thirds of the electrical energy used in the residential colleges.

**NO SAFE LEVEL FOR OZONE.** Even at very low levels, ozone increases the risk of premature death, according to a study sponsored by the Environmental Protection Agency and the Centers for Disease Control. The study found that if a safe level for ozone exists, it is only very low or natural levels and far below current US and international regulations. A 10 part-per-billion increase in the average of the two previous days’ ozone levels is associated with a 0.30% increase in mortality. “Our findings show that even if all 98 counties in our study met the current ozone standard every day, there would still be a significant link between ozone and premature mortality,” said **Michelle Bell**, lead investigator on the study and assistant professor of environmental health at the **Yale School of Forestry & Environmental Studies**.

**CAMPUS-WIDE EFFORTS HELPING THE ENVIRONMENT.** Some 15 months after test running a campus shuttle bus on a mixture of petroleum diesel and biodiesel fuel, an interdisciplinary group of faculty and graduate students at the **University of Connecticut (UConn)** is nearly ready to start producing up to 50 gallons of biodiesel each week. Fifty gallons of alternate fuel can be converted to about 250 gallons of a mixture of biodiesel and petroleum diesel that will be used to fuel campus shuttle

buses. UConn’s blend of biodiesel will be formulated using waste cooking oils from campus dining halls. Other programs involving recycling and sustainability involve students, faculty, and staff, including the **EcoHusky Program**.

**A NATURAL PHENOMENON WITH SOME TEETH TO IT.** For nearly a century it has been recognized that tree and shrub species with toothed leaves are more common in cold climates than warm climates. **Dana Royer**, an assistant professor of earth and environmental sciences at **Wesleyan University**, found that in cold climates with a short growing season, toothed leaves are a big plus for a tree or shrub. In early spring when trees are just leafing out, leaves with teeth tend to lose more water than those without teeth. That process helps pull more nutrient-rich sap from the roots which “jump-starts” the photosynthesis season for toothed plants, a significant benefit in short growing seasons. In warmer climates, the loss of water is a disadvantage that outweighs any value from an early-season jump-start.



### Food & Agriculture

**CONNECTICUT’S BIRD FLU BUSTERS.** **University of Connecticut (UConn)** veterinarian **Sandra Bushmich** supervises the **Connecticut Veterinary Medical Diagnostic Laboratory**. She worries about avian influenza, or bird flu, now cutting a broad infectious path across Asia, Africa and Europe and wonders if the United States is adequately prepared. Connecticut, with its \$200 million commercial poultry complex of over 5 million laying hens and broilers, is vulnerable to an outbreak of the deadly flu. “The disease is already on three continents, and so it’s simply unscientific not to expect it to come here,” says **Mazhar Khan**, a UConn molecular biologist and veterinary pathologist who will also play a critical role in battling avian flu.

**WASABI’S KICK LINKED TO SINGLE PAIN RECEPTOR.** A single pain receptor is responsible for the kick delivered by garlic and mustard oil, which is the active ingredient in mustard and in the pungent green sushi condiment known as wasabi, according to a **Yale School of Medicine** study. The sensory receptor also underlies the response to a variety of environmental irritants, such as acrolein. Acrolein accounts for the toxic and inflammatory actions of tear gas, vehicle exhaust, tobacco smoke, and the byproduct of some chemotherapy drugs widely used in the treatment of cancer, severe arthritis, multiple sclerosis, and lupus. “We identified TRPA1 (the receptor) not only as a promising target for the development of new pain medications, but also for potential new treatments of smoking-related disease and environmental irritation,” said **Sven-Eric Jordt**, assistant professor of pharmacology at Yale.

**UCONN SERVES EGGS FROM UNCAGED HENS.** The **University of Connecticut (UConn)** has agreed to serve “cage-free eggs” in one dining hall, joining a growing movement: colleges that are serving organic or humanely produced food. UConn plans to purchase about 20,000 of the eggs this semester and serve them at **Whitney Dining Hall** as a pilot program with the Humane Society of the United States. UConn also has begun offering locally grown and organic food in Whitney Hall and plans to do the same at other dining halls on the Storrs campus.



### Health

**NOGO PROTEIN AND ALZHEIMER’S.** A protein under investigation as a potential treatment for spinal cord injury may also be able to reduce the plaques associated with Alzheimer’s disease,

# IN BRIEF

## Science and Engineering Notes from Around Connecticut

**Yale University** researchers have found. Increasing the protein—a receptor called Nogo that is found on nerve cells—reduced the concentration of beta-amyloid plaques in the brains of mice bred to develop Alzheimer's disease, the researchers reported. The plaques are associated with diminished cognitive function. Conversely, reducing Nogo receptors increased the amount of plaque that developed in the brains of mice. Manipulating levels of Nogo “may be a way to treat the deficits associated with Alzheimer's disease,” said **Stephen Strittmatter**, co-director of the **Cellular Neuroscience, Neurodegeneration and Repair Program** at Yale.

**IMPLANT HELPS DEPRESSION.** The **University of Connecticut Health Center** is offering vagus nerve stimulation (VNS) therapy for serious depression, a new treatment approved recently by the Food and Drug Administration. The treatment involves implanting a small generator about the size of a stopwatch just under the skin in the left side of the chest and tunneling thin thread-like electrodes under the collarbone to wrap around the left vagus nerve, which relays signals to a part of the brain related to mood and anxiety. Implantation of the device is done in same-day surgery by an otolaryngologist. Then, after a period of about two weeks, psychiatrists work with the patients to program the device to send intermittent, mild electrical pulses through the vagus nerve to the brain and monitor the response.

**REDUCING MORTALITY DURING STROKE.** Patients given lipid lowering agents (LLAs) during an ischemic stroke have a considerably higher survival rate than patients who do not use the cholesterol-reducing drugs, according to recent research by **Yale School of Medicine** investigators. Led by **Yale Department of Epidemiology and Public Health (EPH)** doctoral student **Norrina B. Allen**, the research showed that those given LLAs, primarily of the statin class, within 48 hours of their stroke had a 1% mortality rate in the hospital, compared to the 5.3% rate for patients who were not given this treatment. Statins are drugs that inhibit cholesterol production in the liver.



### High Technology

**SYSTEM AIMS TO MAKE VIDEO CAMERAS BOMB SENSORS.** **Eric Rubenstein**, a researcher and inventor for the East Hartford firm **Advanced Fuel Research Inc. (AFR)**, thinks he has found a way to ease his mind about terrorist attacks. Recently, AFR presented to area technology executives a system called RADSTAR, developed by Rubenstein, which uses sensors already in video cameras to detect radiation. AFR views the technology as a low-cost alternative to the more sophisticated—and expensive—radiation detectors used at ports and high-security buildings. If all goes well, AFR expects ImTelligence, a spinoff that is marketing RADSTAR, to be profitable within three years.

**A BETTER GLOVE.** NASA is daring the nation's inventors to improve on the gloves now worn by space-walking astronauts, and to encourage them, the space agency and its partners recently launched the 2006-2007 Astronaut Glove Challenge during a meeting at the New England Air Museum. Untold thousands of dollars and years of research have gone into NASA spacesuits crafted by **Hamilton Sundstrand**, a division of **United Technologies Corp.**, which sponsored the challenge kickoff conference.

**HIGH-TECH ER.** Electronic recordkeeping and sharing is showing promise in the emergency room at **New Britain General Hospital**. The computer-based model replaced an antiquated system in which patient names were printed in magic marker on a white

board in no particular order, and it was not uncommon for **Jeff Finkelstein**, the chief of the emergency room, to scribble medical orders on a paper towel. Replacing the white board is a billboard-sized, color-coded computer screen that is continually updated as doctors and nurses do examinations, write orders and discharge patients. About 35 computers with flat-screen monitors positioned throughout the emergency room are replacing the paper towels. Doctors and nurses record every detail of care on the screen, which generates a complete medical record, neatly typed.

**DNA PROGRAM BEGINS OPERATION.** After several months of delay, the highly touted mitochondrial DNA program is up and running at the **state police forensics laboratory**, one of four laboratory sites nationwide chosen for the program by the FBI. The expensive, relatively new process for DNA testing can help authorities solve cold cases or identify decayed human remains. The designation of becoming one of the FBI's testing sites came with more than \$1 million in federal funding for training, renovations and up to nine new employees at the laboratory.

**DENTAL INVENTION CHANGED THE WORLD.** A product invented by two **University of Connecticut Health Center** faculty members and manufactured by a Wallingford company has been named one of 25 innovations that changed the world. The product, FibreKor, a composite material used in dental bridges, crowns, splints, and posts, was invented by **Charles Burstone**, a professor emeritus of orthodontics, and **Jon Goldberg**, a professor of oral rehabilitation, biomaterials, and skeletal development, and director of the **Center for Biomaterials**. FibreKor is manufactured by **Pentron Clinical Technologies LLC**. FibreKor was designated as an innovation that changed the world by the Association of University Technology Managers (AUTM) as part of their Better World Project. The project was launched in 2005 to explain in everyday terms how academic research and technology transfer have made the world a better place.



### Transportation

**BILL BOOSTS ROLE OF RAILS.** Public Act 06-136, “An Act Concerning The Roadmap for Connecticut's Ecobconomic Future,” enacted during the 2006 legislative session, created a \$2.3 billion, 10-year transportation package that would pay for new railroad stations and more trains around the state. Once implemented, the plan is designed to unclog gridlock on state highways and to generate economic growth as workers find it easier to get to their jobs and truckers move freight more quickly to businesses, lawmakers said. The package spends \$1.3 billion of federal money and \$1 billion of state money on a wide variety of projects. One of the biggest items is the New Haven-to-Hartford-to-Springfield commuter railroad line, which would include new stations in **Enfield**, **Newington** and **North Haven**.

**PHI SETS ANOTHER MILESTONE.** Another industry milestone was achieved recently by **Petroleum Helicopters Inc. (PHI)**, when it surpassed 1,000 flight hours with its second S-92TM helicopter. This achievement comes just one month after PHI reached 1,000 flight hours on its first S-92. Both aircraft were made by **Sikorsky**, a **United Technologies** company. “The level of service we are able to provide our customers since introducing the S-92 into our fleet has increased greatly. The overall performance, safety and dependability of the S-92 have all been key factors in our ability to utilize this aircraft so extensively in such a short period of operating time,” said PHI chairman and CEO **Al A. Gonsoulin**.

— *Compiled and edited by Robert Vieth*



During the past two years, CCAT's undertakings have garnered strong support from the state legislature. Currently, CCAT administers the Connecticut Small Business Innovation Research Office (CT SBIR Office) for the state Office for Workforce Competitiveness, an outreach effort dedicated to helping more small companies capture research-and-development funding through the federal SBIR program. SBIR sets aside a portion of grants for small businesses offering promising new technologies.

State legislators last year also approved CCAT's establishment of a Center for Manufacturing and Supply Chain Integration. It provides training and assistance to help immerse small-to-medium aerospace and defense manufacturers in the new technologies and business practices that will raise their global competitiveness.

This last session, the state legislature continued its support by authorizing CCAT to develop a hydrogen fuel economic-development plan. The plan will furnish the state with a blueprint for supporting the use of fuel-cell technology as a clean, stable, Connecticut-made alternative energy. It will be developed in coordination with the Connecticut Hydrogen-Fuel Cell Coalition, which CCAT administers.

In addition, CCAT's energy experts are preparing an energy reliability plan to improve the electrical supply for southwest Connecticut. Funded by the US Department of Energy, the plan will identify solutions to ensure reliable power within all critical public safety and health sites in the region. Its recommendations will incorporate alternative-energy strategies to reduce costs, increase efficiency, cut greenhouse emissions and boost economic development.

"CCAT is important because it consolidates many of the disparate, high-tech activities taking place in Connecticut, particularly regarding fuel cells, the hydrogen highway and nanotechnology," said state senator Gary D. LeBeau, (3rd District), co-chairman of the Commerce Committee. "These are the cutting-edge technologies in which Connecticut must invest to create the jobs of tomorrow, and CCAT is helping get that done."

Keenly aware of the shortage of science and technology talent impacting Connecticut industry, CCAT is joining the immense effort required in order to rekindle an interest in engineering, science and manufacturing among US students. It is an effort dependent upon strengthening the math and science skills needed for these careers.

To prime the pipeline of innovators and entrepreneurs at its source, CCAT is reaching out to the elementary and secondary grades, bringing into the classroom project-based programs that, while reinforcing the basics, lead students to discover the creativity and expansive possibilities of careers in science, engineering and technology. One such program is Science Act, connecting students in Connecticut and China to work collaboratively on the issue of global warming.

Another is LaunchQuest. This summer, Farmington-based UP Aerospace will launch the first commercial sounding rocket from New Mexico's newly-constructed spaceport. Contained in its payload will be student experiments from 40 schools around the nation, including 14 in Connecticut. CCAT purchased the payload space, visited classrooms and provided special software allowing students to collaborate by computer.

This month, two conferences will highlight CCAT's efforts. A June 21-22 conference, organized jointly by the CT SBIR Office and NALI, features representatives of six top defense contractors and six federal agencies who will discuss their future technology and manufacturing needs with small companies and suppliers. On June 23, NALI will conduct an in-depth review of its programs and activities. Both events will be held at The Club at Rentschler Field in East Hartford.



*Addressing approximately 200 Academy members, dignitaries, and guests, including student winners of state science competitions and their families, who attended the 31st Annual Meeting and Dinner of the Connecticut Academy of Science and Engineering on May 24, 2006, Academy member and CCAT's chief of innovation and technology Karl Prewo discusses the center's current status and future plans. [Photo courtesy: Al Malpa]*

In its near future, CCAT will be fulfilling Larson's vision of having the region anchor a national center of excellence: the National Center for Aerospace Leadership (NCAL). Bringing labs, researchers and technology experts together under one roof, NCAL will be a center of technological advancement for the US military, its contractors and their suppliers—advancements that will spread to commercial industries.

"The region needs and deserves an organization—a catalyst—that focuses on the transition of global technology for people in the region and the nation to use," Prewo said. "Our mission is to assure that Connecticut remains a recognized and vital world leader." [Editor's Note: This article was written by Lizabeth Hall, Communications Director, Connecticut Center for Advanced Technology, and provided to the Academy for publication.]

## From the National Academies (from page 1)

also should announce its strong desire to become the host country for the ILC, the report says.

[[http://www.nap.edu/catalog/11641.html?onpi\\_newsdoc04262006](http://www.nap.edu/catalog/11641.html?onpi_newsdoc04262006)]

### ◆ NASA Lacks Resources for Vigorous Science Program

NASA does not have the resources necessary to maintain a vigorous science program, complete the International Space Station, and return humans to the moon, according to a new, congressionally mandated report from the National Research Council.

"There is a mismatch between what NASA has been assigned to do and the resources with which it has been provided," said Lennard A. Fisk, chair of the committee that wrote the report and Thomas M. Donahue Collegiate Professor of Space Science, University of Michigan, Ann Arbor.

The committee reviewed NASA's plan for research programs for the next five years in space science, which includes astrophysics, heliophysics, planetary science, and astrobiology; earth science; and microgravity life and physical sciences. The committee found that the program proposed for space and earth sciences is neither robust nor sustainable, and that it is not properly balanced to sup-

(See National Academies, page 8)

port a healthy mix of small, moderate-sized, and large missions. It recommends that NASA restore small missions, research and analysis programs, and technology investment in the future missions. The agency also should preserve the ground-based and flight research required to support long-duration human space flight.

[<http://www.nap.edu/catalog/11644.html>]

◆ **Strengthen Nation's Organ Donation System**

A new report from the Institute of Medicine urges federal agencies, nonprofit groups, and others to work to provide greater opportunities for people to record their decisions to donate organs, strengthen efforts to educate the public about the benefits of organ donation, and continue to improve donation systems. The report also supports initiatives to increase donations from people whose deaths are the result of irreversible cardiac failure, but said that the nation is not yet ready to enact policies that presume consent to donate unless individuals opt out.

Most organs come from deceased donors whose deaths have been determined by neurologic criteria based on the irreversible loss of activity in the brain, including in the brain stem. Many more deaths are determined based on circulatory criteria, meaning an irreversible loss of heart function that leads to permanent cessation of blood circulation. The committee recommends that federal agencies work with states and cities that have extensive trauma centers and emergency response systems to develop demonstration projects that can determine the feasibility of increasing rates of donation after circulatory determination of death.

Financial incentives—including direct payments, coverage of funeral expenses, and charitable contributions—should not be

used to increase donation rates, the report says. Addressing the question of organ donation by living individuals, the report recommends that hospitals provide independent advocacy teams to each person who volunteers to be a living donor to ensure that the individual's decisions are fully informed and voluntary.

[[http://www.nap.edu/catalog/11643.html?onpi\\_newsdoc05022006](http://www.nap.edu/catalog/11643.html?onpi_newsdoc05022006)]

◆ **Reuse of Disposable Medical Masks and Respirators in Event of Pandemic Not Advised**

A new report from the Institute of Medicine (IOM) says that there is currently no simple, reliable way to decontaminate inexpensive, disposable medical masks and respirators that would enable people to safely use them more than once. The use of protective face coverings will be one of many strategies used to slow or prevent transmission of the flu virus in the event of a pandemic, even though scientific evidence about the effectiveness against influenza is limited. Because these devices are expected to be in short supply if a pandemic strikes in the near future, the US Department of Health and Human Services asked the IOM to investigate the potential for reuse of disposable respirators or masks.

The report found that it is possible that an individual could reuse an N95 respirator by following a series of steps to protect it from contamination; however, because the effectiveness of any face coverings against flu is unclear, the committee that authored the report urges wearers not to risk unnecessary exposure. The report urges that research be conducted to test how well masks, respirators, and other new filtering materials specifically protect against the spread of flu viruses.

[<http://www.nap.edu/catalog/11637.html>]

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