

Bulletin of the

CONNECTICUT ACADEMY OF SCIENCE AND ENGINEERING



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UPDATE: The Connecticut Center for Science & Exploration

The Connecticut Center for Science & Exploration has made tremendous progress, including breaking ground on October 21, 2005, unveiling exhibit plans, launching a new website, and adding four prominent leaders to its Board of Trustees. In addition, the Center is now 87% of the way to its goal of raising \$149.5 million.

An Exhibit Concept Plan was adopted by the Center's Board of Trustees, organizing and describing exhibit topics throughout the Center's six major exhibit areas and four floors.

Level 1: Science Alley; Children's Gallery

Level 2: Physical Science; Art, Music & Culture; Human Health; Sports Science

Level 3: Connecticut Inventions; Space Science; Traveling Exhibits Gallery

Level 4: Earth Science; Connecticut River; Clean & Efficient Energy

Next, the exhibit planning team will design each exhibit area in preparation for fabrication and installation before the opening in 2008.

The Center also has launched the new Future Capsule, an interactive electronic repository of ideas. Predictions are being collected from all over the world and may be deposited into the capsule via the Center's website. In addition to the online Future Capsule, the Center's new website offers details and renderings of the facility and exhibits, and educational resources for teachers. Please visit www.ctcse.org.

Four prominent leaders joined the Center's Board of Trustees this fall. They include Dean Kamen, inventor of the Segway and founder of the FIRST Robotics competition; Joseph Lacher, Executive Vice President and CEO of Personal Lines for St. Paul Travelers; Anthony March, President of Tony March Automotive and sponsor of learning incentive programs, and Walter Wick, world renowned photographer and co-author of the educational I-Spy book series. — *Michelle Morales*

Connecticut's Challenge:

Protecting the State's Diverse Habitats for Future Generations

A meadow lark from 1870 lies in a drawer — its belly butter yellow, its beak opened like miniature tweezers. A shark is suspended in a jar of ethanol — its body squiggly and coiled. Pinned to a backboard is an early fern — its intricate fractal pattern exquisitely detailed.

These are but three exhibits from the Biological Research Collection at the University of Connecticut (UConn). The collection displays plants and animals of every type — some three quarters of a million specimens in all.

For those who tour this new, state-of-the-art facility, "biodiversity" becomes more than an abstract concept: it becomes real, vivid and immediate. Here, one is exposed to the wonders of the organic universe, whose origins go back to the beginning of time.

In today's hard-edged world of highways and urban sprawl, it is easy to forget about the gooey, creepy, crawly, boney, colorful biological world that underlies everything. The trouble is this: many of the species showcased in the UConn collection are already extinct, and others are threatened with extinction.

"It's not as if they are incidental. Each plays a specific role in the balance of life," says Jane E. O'Donnell, manager of the collection.

She and fellow biologists are keen about the need for Connecticut to protect its biodiversity. The state is small, but it has a notably diverse variety of habitats — from the Berkshire hills to the estuaries of Long Island Sound.

Members of Connecticut's academic community are doing everything they can to underscore the importance of preserving what's left of this mix.

(See Biodiversity, page 2)

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.

◆ Broad Federal Effort Needed to Create New, High-Quality Jobs for All Americans in 21st Century

In today's world, where advanced knowledge is widespread and low-cost labor is readily available, US advantages in the marketplace and in science and technology have begun to erode. A new report from the National Academies, requested by Congress, concludes that as a result, a comprehensive and coordinated federal effort is urgently needed to bolster US competitiveness and pre-eminence in these areas. The report, by a 20-member committee comprised of university presidents, including Yale University president Richard Levin, CEOs, Nobel Prize winners and past presidential appointees, makes four recommendations along with 20 implementation actions that federal policy-makers should take to create high-quality jobs and focus new science and technology efforts on meeting the nation's needs, especially in the area of clean, affordable energy:

- 1) Increase America's talent pool by vastly improving K-12 mathematics and science education;
- 2) Sustain and strengthen the nation's commitment to long-term basic research;
- 3) Develop, recruit, and retain top students, scientists, and engineers from both the U.S. and abroad; and
- 4) Ensure that the United States is the premier place in the world for innovation.

Some actions will involve changing existing laws, while others will require financial support that would come from re-allocating or increasing existing budgets.

<http://www.nap.edu/books/0309100399/html>

(See National Academies, page 7)

Getting the Message Out with BioBlitz

One means of publicity is the annual program known as BioBlitz. The event is part festival, part competition, part serious research expedition. Dozens of top scientists gather at one particular site, along with middle school students. The idea is to see how many different species they can come up with in one 24-hour period.

Some 170 scientists and 30 students participated in the Sixth Annual BioBlitz on June 3, 2005 at Two Rivers Magnet Middle School in East Hartford.

The school is set amidst highway interchanges. Nearby are glass office buildings. It would seem to be far from anything natural. Yet by the end of the 24 hours, the scientists and students had gathered some 1,800 different species. And all this from an area within a 2.5 mile radius of the school.

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By working alongside adults, students get to see the scientists in action, trekking through fields, wading into ponds, and setting up screens to capture bats and other flying creatures. The biologists peer through microscopes, analyze DNA, and write up their findings in scientific terms.

Ordinary people can begin to grasp these wonders — "simply step outside!"

This prescription comes from Edmund Smith, an eighth-grade science teacher at Two Rivers and one of the key organizers of this year's BioBlitz. Smith is passionate about his subject. He wants to impart to his students the same sense of awe he feels about the natural world.

Magnet school students, by definition, come from widely differing backgrounds. A suburban youngster may sit next to a child who comes from the inner city. But whether they come from the suburbs or the city, most of today's youngsters tend to lead their lives indoors, Smith says. They dwell in a world of box stores, malls, television, and other digital gadgets.

"[These kids] don't have a connection to the underbelly of life."

Smith thinks back to the time he spent hiking, traveling, camping out under the stars. "These kids may be missing something fundamental," he says. "They don't have a connection to the underbelly of life."

He cites the recent hit movie *March of the Penguins*. The critically acclaimed film spotlights the intense challenges the birds face in Antarctica.

"We sit in a theater, on soft seats. We glimpse how they live. But we ourselves don't have the accompanying bodily experience — the cold, the snow, the glare," he says.

This talk is not philosophical rumination. It is about a practical new reality, he says. Most people do not know how important global ecology is, how closely related it is to our own well-being as a species.

"Creepy-crawlies and weeds are the very foundation of life, the little things that run the earth, cycle and recycle nutrients, create the air and soil," writes prize-winning biologist Edward O. Wilson of Harvard University. "Without them, terrestrial ecosystems of the world would collapse, making human life unsustainable."

His colleague and occasional co-author Stephen Kellert, of Yale, adds: "Because the natural world influences our emotional, cognitive, aesthetic and even spiritual development, losing touch with nature exposes us to a diminished existence."

Both scientists explore ways of preserving ecological balance, while dealing with mankind's need for money with which to live. Buildings can be designed better. Land can be used more thoughtfully. Conservation can reduce waste. Economies can be made more sustainable in a host of ways, they argue.

"Sprawl" and how to limit it is the subject of ongoing debate in Connecticut and around the country. Sprawl is defined by *The Hartford Courant* as "relentless, helter-skelter development that chews up the landscape at an appalling rate and diminishes our quality of life." A special issue of its *Commentary* section on October 9, 2005 was devoted to the topic.

In the past 30 years, the state's population has grown by 12%, but the amount of land in residential use increased by 102%. That inevitably translates into loss of habitat. Twenty other states have

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Business & Industry

COMPETITIVENESS COUNCIL SEEKS TO BOOST ECONOMY.

At a recent meeting of business, education and state government leaders, recommendations were formulated to strengthen the state's economy and increase employment opportunities. The council's meeting focused on reports from six of the nine "industry clusters," which are industry-financed units designed to bring together businesses and to attract new ones to the state. **Governor M. Jodi Rell** said there is a sense of urgency about the state's economic future, rekindled by a report from the **Connecticut Economic Resource Center** warning that the state was losing its competitive edge [See <http://www.cerc.com/benchmarks>]

HAVE NERD, WILL TRAVEL. Chronic sluggishness in her desktop computer was making it impossible for Cheryle Newton-Ferante to do her job — managing medical records for a local health company— at home. Documents took forever to open, and Internet access times were abysmal. Enter **NerdsToGo, Inc.**, a Guilford-based service that dispatches technicians to analyze and fix computers on-site. Within about an hour, **Brian Festa**, one of the company's "certified Nerds," had removed unused and unneeded files, updated security software and checked for adequate memory, to be installed on a follow-up visit.

KIDDE DONATES CO ALARMS TO FIRE MARSHAL'S OFFICE.

The **Connecticut State Fire Marshal's Office** is receiving a donation of 700 carbon monoxide (CO) alarms from **Kidde**, a division of **UTC Fire & Security**. Kidde president **Ed LeBlanc** emphasized that the donation will help ensure that low-income families meet the mandate of a new state law, HB6894, requiring CO alarms in newly constructed one- and two-family residences. According to the fire marshal's office, firefighters responded to 1,400 carbon monoxide calls in 2004, with the winter months putting residents at particular risk of CO poisoning. The announcement was made at a press conference held by **State Representative Stephen Dargan**, who was instrumental in passing the new law.

Pfizer Acquires Vicuron Pharmaceuticals. **Pfizer Inc.** has completed its acquisition of **Vicuron Pharmaceuticals Inc.**, a biopharmaceutical company focused on the development of novel anti-infectives for both hospital-based and community-acquired infections. Through the transaction, Pfizer has acquired two new product candidates currently under review by the US Food and Drug Administration (FDA): anidulafungin for fungal infections and dalbavancin for Gram-positive infections. The addition of these product candidates broadens Pfizer's presence in anti-infectives.

VENTURE-BACKED COMPANIES RAISING MORE CAPITAL.

Venture-backed companies in Connecticut raised more money in the second quarter of 2005 than in the first, approximating the funding levels of \$209 million in 2002. The largest investment in Connecticut went to **Kelson Physician Partners, Inc.**, a pediatric healthcare company that received \$15.0 million in investment dollars. **Vbrick Systems, Inc.**, a Wallingford company that develops duplex video networking products, received \$5.0 million. In the third largest deal for the quarter, East Granby-based **Nufern Fibers**, a manufacturer of fiber laser, amplifier modules and specialty optical fibers, received \$4.3 million.



Communication

BLOG, BLOG, BLOG... With the explosion in Internet access, blogs, or on-line diaries, have proliferated throughout the nation. **Tom Fausel**, a technology consultant who lives on a farm in Harwinton, has been assembling a list of Connecticut blogs on his site, ctweblogs.com, since December of 2004. While blogs often reflect the personal interests of individuals, Connecticut corporations and small businesses are creating their own blogs to keep in touch with employees and customers. Even newspapers like the **New Haven Register** that have regular columnists also have blogs by writers to provide readers with another avenue to hear from the newspaper's reporters.

ELECTRONIC BILLBOARD SIGNALS NEW WAVE IN

ADVERTISING. New digital billboards, like the one recently erected on I-84 in Hartford, are helping to usher in a new era of billboard advertising. The billboard, owned and operated by **Lamar of Hartford**, is the company's largest digital board (14 by 48 feet) and the largest in New England. Digital pictures are sent to the giant LED screen using a DSL connection. Advances in picture quality allow images to be expanded without sacrificing quality. Design work is done on a computer, which saves on production costs and transforms billboards into remarkably flexible marketing tools that can be quickly modified or adjusted.

NEW TECHNOLOGY IMPROVES CRITICAL COMMUNICATIONS.

Research at the **University of Connecticut Health Center's** new acoustics laboratory is studying the effectiveness of hearing protectors equipped with noise reduction systems. "We are working on technology that can combine noise reduction systems to prevent hearing loss, while at the same time enhancing speech and the ability to hear warning alarms," says principal investigator **Anthony Brammer** of the new **Biodynamics Laboratory**. Airplane pilots, military personnel, and others who work in noisy environments may benefit from the devices, which can be either mounted in a headset or worn in the ear canal.

PREVENTING COMMUNICATION ERRORS IN TELEPHONE

MEDICINE. To prevent medical mishaps with patients caused by telephone communication failures, researchers at **Yale School of Medicine** and the **VA Connecticut Healthcare System** report in the October 2005 issue of the *Journal of General Internal Medicine* that expanded physician and residency training in telephone medicine is needed. Studies have shown that although 25% of interactions between physicians and patients occur on the telephone, only 6% of residency programs teach telephone medicine. The study was headed by **Anna B. Reisman**, assistant professor in the department of internal medicine at Yale.



Education & Cognition

"DISCOVERY TO CURE" PROMOTES INTEREST IN SCIENCE. Students from six area high schools completed a research internship this past summer, working with faculty and staff in the **Yale School of Medicine's Department of Obstetrics, Gynecology & Reproductive Sciences**. "Our goal is to expose high quality

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

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students to Yale's labs and possibly open their minds to career opportunities," said the program's creator **Gil Mor**, associate professor of obstetrics and gynecology. The students were paired with a postdoctoral fellow, graduate student or laboratory technician who supervised them. They learned a variety of research techniques such as PCR, a method used to amplify genes to as much as 1,000 times their size. **Tyco Healthcare/US Surgical Corporation** and **United Illuminating Company** were among those supporting the program.

INNOVATIVE JOINT DEGREE PROGRAM IN PUBLIC HEALTH.

A new degree program for undergraduates who are interested in improving public health has been launched by the **Department of Epidemiology and Public Health (EPH)** at the **Yale School of Medicine**. Through the five-year Select Program in Public Health, undergraduates can earn a BA or BS at **Yale College** and a MPH from EPH. The program is designed to give students a broad understanding of the factors that shape the health of populations and to equip them with the tools to determine how health shortfalls might be addressed effectively. It complements interests in such related professions as medicine, law and management, and offers socially meaningful application for theoretical training in both the physical and social sciences.

'NUMB3RS' TV SHOW SCORES WITH MATH TEACHERS.

The National Council of Teachers of Mathematics (NCTM) and Texas Instruments have begun distributing lesson plans for students derived from the CBS show "NUMB3RS," a crime series featuring an FBI agent who teams up with his mathematician brother to analyze cases by using mathematics. "Math and the media — imagine that," said NCTM president Cathy Seeley, who was attending the council's three-day national conference at the **Connecticut Convention Center**. "The students' reaction was great," reported **Jennifer Voccola**, an eighth-grade teacher from **Central Middle School** in **Greenwich**. "A lot of them are familiar with the show. Any real connection we can make for the kids is great."

SCIENCE EDUCATION AWARD STRIVES TO INCREASE

SCIENCE LITERACY. The National Institutes of Health (NIH) has announced that **Yale's Peabody Museum of Natural History** will receive a Science Education Partnership Award to immerse students in science, increase science literacy and encourage research careers. In Phase I of the program, led by **Leonard Munstermann** of the **Yale School of Medicine's Department of Epidemiology and Public Health**, investigators from Yale and **The Connecticut Agricultural Experiment Station** — together with the Peabody Museum educators — will work with a group of 10 science teachers from three school districts to design curricula to create a better understanding of the dynamics and biology of how disease is transmitted. Phase II will distribute the curricular resources developed in Phase I regionally and nationally.

SOUND LEARNING IN NEW HAVEN HARBOR.

High school student **Jessica Rodriguez** peers into a light fog and then nudges the throttle forward on a 50-foot research boat, the *Island Rover*. The *Rover* is operated by the **Sound School**, a **New Haven** public school, and is used by students for activities such as collecting marine specimens, taking water samples and giving passenger tours. The school is one of 19 regional vocational agriculture centers around the state, but one of only two devoted chiefly to aquaculture studies. The recent addition of the *Island Rover* enables the School to offer courses such as the vessel operations class, teaching basic navigation and operational skills.



Energy

ARCHITECTURE STUDENTS HARNESS THE SUN. Students at the **Yale School of Architecture** have constructed the first home in **New Haven** to use solar photovoltaic panels to produce electricity. The **First-Year Building Project**, a program required of Yale's architecture students, is a unique experience in design and construction, as well as an opportunity to deal with such challenges as budget constraints, client needs, neighborhood context and environmental sustainability. Students use environment-friendly materials, fuel-conserving technology and renewable sources of energy, with support from the **Connecticut Clean Energy Fund**. The home includes roof-mounted photovoltaic panels providing 50% of the electricity needed by an average family, reports **Paul Brouard**, who has directed the Project for 33 years.

CO-GEN PLANT TO MEET ENERGY NEEDS. A new co-generation plant at the **University of Connecticut (UConn)** is expected to save nearly \$180 million in energy costs during the next twenty years. Co-generation refers to the plants' ability to produce multiple forms of energy. The plant is powered primarily by three gas turbines that are modifications of jet engines, and by a steam turbine. In addition to producing domestic heat, any "leftover" heat can be captured to produce electricity through a recovery system. There is very little waste, according to **Ken Weseman**, chief engineer at the plant. The concept of operating a co-generation plant at UConn was first raised in the 1990s, when now emeritus engineering professor and Academy member **Lee Langston** raised the idea.

FUEL CELLS TAKING HEAT OFF NEW YORK POWER GRID.

With 90°F. temperatures and energy usage reaching record levels last summer, New York used technology often perceived as futuristic to help handle the demand. The 30 stationary fuel cell power plants that have been delivered by **UTC Power**, a unit of Connecticut-based **United Technologies Corporation**, to sites throughout New York State over the last 12 years are approaching the equivalent of 81 years of operating time. Each of the company's PureCell™ 200 fuel cell units produces enough electricity to power 150 homes for a year. "New York has been important to the evolution of the entire fuel cell industry and the state's alternative energy portfolio will continue to strengthen," **UTC Power President Jan van Dokkum** said.

HIGH ENERGY COMPETITION FOR HIGH ENERGY.

Two Connecticut companies are submitting plans to build the world's largest fuel cell power plant on Long Island. South Windsor's **UTC Power**, a division of **United Technologies Corporation**, and Danbury-based **FuelCell Energy Inc.** are vying to build a 10-megawatt plant planned by the Long Island Power Authority. The contract competition highlights Connecticut's lead in fuel cell technology for stationary power generation.



Environment

JUST WHISTLE A HAPPY TUNE. Working from previously unpublished data provided to them by John Fitzpatrick and colleagues at Cornell University, ornithologists at **Yale University**, the University of Kansas, and Florida Gulf Coast University have confirmed the existence of the Ivory-billed Woodpecker. Yale ornithologist **Richard Prum** states, "We were very skeptical of the first published reports, and thought that the previous data

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were not sufficient to support this startling conclusion. But the thrilling new sound recordings provide clear and convincing evidence that the Ivory-billed Woodpecker is not extinct." These recordings provide the first evidence of the existence of more than one individual Ivory-bill.

CONTROLLING LYME DISEASE TICKS AROUND THE HOME.

Researchers at **The Connecticut Agricultural Experiment Station**, in partnership with the **Connecticut Department of Public Health**, have been studying Lyme-disease prevention in cooperation with the Westport, Weston, Ledge Light and Torrington Area Health Districts. The primary goal is testing control by insecticidal killing of ticks brought to bait boxes by small mammals, such as mice. Other goals include testing an insect-eating fungus as an alternative to chemical pesticides and providing information on tick management to health districts. A Tick Management Handbook is available at the Experiment Station's website at <http://www.caes.state.ct.us>.

LYME DISEASE PREVENTION PROGRAM LAUNCHED.

Researchers at the **Emerging Infections Program (EIP)** at the Yale School of Medicine, in partnership with the Connecticut Department of Public Health, have launched a Lyme disease prevention study in 21 Connecticut communities. They are evaluating the effect on Lyme disease risk of personal protection and landscape modification. Personal protection includes wearing insect repellent; performing bodily tick checks and tucking pants into socks. Landscape modifications refer to applying pesticides to a yard, keeping deer out of the yard with fencing and discouraging deer with deer-resistant plants.

RESOLVING CLIMATE CHANGE DATA DISCREPANCY. The effect of the sun's heat on weather balloons largely accounts for a data discrepancy that has long contributed to a dispute over the existence of global warming, according to a report by scientists at **Yale University** and the National Oceanic and Atmospheric Administration (NOAA). The report, published in the journal *Science*, says that direct heat of the sun on temperature probes of the weather balloon (radiosonde) probably explains the discrepancy between reports showing that atmospheric temperatures have been unchanged since the 1970s, while temperatures at the Earth's surface are rising. The key to the error in climate change estimates lay in instrument design. With exposed sensors, measurements taken in daylight read too warm.

'CANARY DATABASE' A COLLECTION OF ANIMAL SENTINEL DATA. There have long been reports of animals succumbing to environmental hazards before humans show signs of illness — typified by the concept of the "canary in a coal mine" — which suggest that animals may be useful sentinels for human environmental health hazards. **Peter Rabinowitz**, associate professor of medicine in the **Yale Occupational and Environmental Medicine Program**, is leading a project to assemble a user-friendly database containing scientific evidence about how animal disease events can be an early warning system for emerging human diseases. The Canary Database of Animals as Sentinels of Human Environmental Health Hazards, a web-based collection of animal sentinel studies that have been collected and curated in terms of their relevance to human health, may be accessed at <http://canarydatabase.org>.

UCONN TAKES AN ENVIRONMENTAL VIEW. An indoor practice field made from recycled shoes, a rain garden that filters storm water runoff, and an amphibian crossing planned to help thousands of wood frogs and spotted salamanders safely cross a new entrance road to campus are just some of the several steps

the **University of Connecticut** is taking to foster a more environmentally friendly campus. The school has made a concerted effort recently to recycle and preserve natural resources, part of a national trend on campuses. Most of the changes have taken place in the last three years, since the university hired its first environmental manager, **Richard Miller**, to minimize the impact of the university's \$2.3 billion UConn 2000 construction program and to promote a more sustainable environment.



Food & Agriculture

GENETIC KEY TO HARDIER PLANTS. A team of scientists led by **Roberto Gaxiola**, an assistant professor-in-residence of plant science at the **University of Connecticut**, has discovered a genetic key to generating plants that are more productive, more drought-resistant, and can grow in soils low in nutrients. Over-expression of a single specific gene significantly enhances the transportation of the primary plant growth hormone, auxin, and results in plants with stronger, more extensive root systems and as much as 60% more foliage, the researchers report in the October 7 issue of *Science*. The research team's findings are likely to be particularly significant for farmers in developing countries, including Gaxiola's native Mexico, because many live in arid regions and lack irrigation systems and money for the amount of expensive fertilizers needed to feed plants with less expansive root systems.

NICOTINE CAN MAKE YOU CRAVE FOOD. A new study shows that prior nicotine exposure in mice can increase their motivation to work for food, weeks after their last exposure to nicotine, a finding that runs counter to the popular belief that nicotine exposure curbs appetite. The study provides insight into one of the most vexing issues related to smoking cessation, one that discourages many people from attempting to quit smoking, the prospect of weight gain. "Although acute nicotine can act as an appetite suppressant, these data are the first to suggest that repeated exposure to nicotine has the opposite effect, that nicotine increases motivation for food for weeks following exposure to the drug," said **Darlene Brunzell**, associate research scientist in the **Department of Psychiatry** at **Yale University**.



Health

ADOLESCENTS' HIV RISK REDUCED WITH COMMUNITY INTERVENTION. According to a study by a team of **Yale** researchers led by **Kathleen J. Sikkema**, associate professor in the **Division of Chronic Disease Epidemiology, Social Behavioral Sciences Program** in the **Department of Epidemiology and Public Health** at the **Yale School of Medicine**, community-level intervention program aimed at young adolescents delays early intercourse, increases condom use and reduces the type of risky sexual behavior that can result in sexually transmitted diseases and HIV/AIDS. The intervention consisted of AIDS education, skills training, peer influence and both family and neighborhood support to avoid and reduce high-risk behavior among adolescents. Community-level interventions have proven to be successful with gay men, injection drug users and inner-city women, but this was one of the first to have targeted adolescents.

DRUGS DO DOUBLE DUTY. Two popular blood pressure drugs pack a double punch: they can also reduce the risk of diabetes, according to researchers at the **University of Connecticut School of Pharmacy**. The two classes of drugs (Ace Inhibitors and ARB Blockers) are commonly used to treat high blood pressure,

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said **Craig Coleman**, assistant professor of pharmacy practice. However, the finding of a protective effect on patients without diabetes is new and likely to have an impact on the drugs doctors choose for patients with high blood pressure. Diabetes is the sixth-leading cause of death in the United States and often contributes to heart disease, high blood pressure, and blindness.

ASTHMA SEVERITY GENE IDENTIFIED. Asthma is a clinical syndrome of airway inflammation, excessive response, and airflow obstruction to the lungs. Once an individual has asthma, there are genes that control how bad it is, according to **Richard Bucala**, professor in the **Department of Internal Medicine at the Yale School of Medicine**. Patients with asthma produce migration inhibitory factor (MIF), a gene product that regulates immunity, in their serum and in the fluid that lines their lungs. When challenged with a trigger for their asthma attack, genetically deficient mice had less pulmonary inflammation and lower airway hyper-responsiveness than control mice. Similarly, in an analysis of 151 Caucasian patients with mild, moderate and severe asthma, there was a significant association between mild asthma and the low expression of MIF.

PATHOLOGICAL GAMBLING AND MAJOR DEPRESSION. The correlation between pathological gambling and major depression in middle-aged men appears to be heavily influenced by overlapping genetic factors, according to a study by researchers at the **Yale School of Medicine** and Washington University's School of Medicine. The Vietnam-era Twin Registry was used as the basis for the study. Twin studies allow researchers to estimate the extent to which genetic makeup and environment contribute to psychiatric disorders. Comparisons can be made between identical, or monozygotic, twins, and fraternal, or dizygotic, twins. These studies already have identified a heritable component to pathological gambling and genetic overlaps between both pathological gambling and alcohol dependence and pathological gambling and antisocial behaviors.

PERSONALIZED MEDICATION. Genetic tests could one day help doctors prescribe the optimum drug for a specific patient with hypertension, and identify which patients face a high risk of excessive bleeding after taking anti-coagulants, according to Academy member **Gualberto Ruano**, president and CEO of **Genomas Inc.**, a Hartford biotechnology company that is marketing the tests. One of the goals of Genomas and other companies marketing "personalized medicine" technology is to help doctors get a better handle on individual differences. Researchers then can compare the individual's genetic characteristics to genetic data on drug response in larger populations, to identify whether the patient might be at risk of an adverse reaction to a specific medication.

MOLECULAR BASIS FOR PHANTOM PAIN. A **Yale** study reports the first evidence that phantom pain following spinal cord injury is the result of hypersensitive neurons in the thalamic region of the brain that can be suppressed with specially designed molecular agents. Typically, the perception of pain travels through three orders of neurons. The study reports that in rats with spinal cord injury, third-order neurons within the thalamus spontaneously and abnormally fire signals in the absence of any incoming signals from the first-order neurons. It also reports that these rogue neurons contain abnormally high levels of a particular type of sodium channel, called Nav1.3. Sodium channels serve as batteries during the conduction of nerve signals. The researchers designed targeted molecular agents against Nav1.3 and injected them into the spinal fluid of the injured rats, producing a significant reduction in the presence of Nav1.3 in second and third order neurons accompanied by a reduction in signals that they produced.



High Technology

A MICROCHIP OFF THE OLD BLOCK. A researcher at the **University of Connecticut** will soon enter the demonstration phase of a new microchip technology that he predicts will revolutionize electrical systems in everything from computers to cell phones to missiles. **Geoffrey Taylor**, a professor of electrical and computer engineering, will soon complete work that integrates both light-generating and light-detecting functions into a single chip of semiconductor, replacing connections now limiting interconnection speed with optical links. "The optical links require much less power, so much higher speed chips are possible, which translates to higher speed systems," Taylor says. "The interchangeability of electrical and optical signals will change the way in which circuits and systems are designed."

NEW MATERIALS RESEARCH SCIENCE AND ENGINEERING CENTER. The National Science Foundation has awarded a six-year, \$7.5-million grant to establish a **Materials Research Science and Engineering Center (MRSEC)** at **Yale University** and **Southern Connecticut State University (SCSU)**, with participation by Brookhaven National Laboratory. "By combining the strengths of Yale, SCSU and Brookhaven, we will explore how the properties of artificially structured materials change as the size of devices constructed from them approaches atomic dimensions," said **John Tully**, the MRSEC director. The center will also have a significant educational focus by working to increase science literacy throughout the southern Connecticut community.

HOW CRYSTALS FORM. Researchers in many fields will now be able to tailor material properties that are sensitive to microstructure. **Ainissa G. Ramirez**, assistant professor of mechanical engineering at **Yale University**, led a team of researchers to devise a way to predict the microstructure of crystals as they form in materials. Although there are theoretical models that predict grain size and ways to monitor the growth of individual crystals, this new method makes it possible to estimate grain size and therefore the properties of materials that are dependant on microstructure. The novel contribution of this work is that the nucleation and growth rates are measured independently during crystallization and used to infer the grain size after the completion of crystallization.



Transportation

JET ENGINE CONSORTIUM AGREES ON SALE. **International Aero Engines (IAE)**, an East Hartford-based jet engine consortium, has announced the biggest order in its history — a \$1.7 billion deal that means profits and steady work for its part-owner, Pratt & Whitney. IAE said it has agreed to sell 200 of its V2500 engines, plus an unspecified number of spares, to IndiGo airlines, a low-cost startup venture that will operate in India. The engines, which would power a fleet of 100 Airbus A320-class aircraft, are set for delivery over a 10-year period, starting in July 2006.

BRADLEY REBOUNDS. With an expanded main terminal and 20 newly scheduled flights, Bradley International Airport is on track to set a record for passenger traffic this year. Airport administrator Barry Pallanck reports that 6,184,266 passengers flew to or from Bradley between Jan. 1 and Oct. 31. That reflected average growth of 11%, compared with the same period in 2004. Similar growth during the last two months of the year would mean a record-setting total of almost 7.47 million passengers in 2005.

— *Compiled and Edited by Robert Vieth*

From the National Academies (from page 1)

◆ ‘Clean’ Vehicle Research Initiative on Track, But Faces Many Challenges Ahead

A public-private effort to develop more fuel-efficient automobiles and eventually introduce hydrogen as a transportation fuel is well planned and identifies all major hurdles the program will face, according to a new report from the National Research Council. Many technical barriers must be overcome and new inventions will be needed, but the program, which was launched three years ago, has already made an excellent start, the report finds. The FreedomCAR (Cooperative Automotive Research) and Fuel Partnership, a research collaboration among the US Department of Energy (DOE), the Big Three automakers, and five major energy companies, seeks to develop emissions-free and petroleum-free vehicles. The program includes the President’s Hydrogen Fuel Initiative, initiated in 2003 to develop technologies for hydrogen production and distribution, and is a successor to the Partnership for a New Generation of Vehicles, a collaboration between federal agencies and automakers during the Clinton administration.

The long-term goal of the partnership is to develop technology that will help automakers decide by 2015 whether it is possible to manufacture and sell hydrogen-powered vehicles on a large scale. The program’s partners are examining cost-efficient and safe ways to produce hydrogen from traditional and renewable energy sources, distribute it via filling stations, store it in vehicles, and convert it to electricity with fuel cells. The program also sponsors research to reduce the size, weight, and cost of all of the vehicle components needed. The program also is exploring technology that, in the short term, will provide more efficient and less polluting combustion engines, as well as electric batteries that could be used in hybrid vehicles with either fossil fuel- or hydrogen-powered engines.

The study finds the current funding split — 30% for short-term activities such as research on advanced combustion engines and electric batteries and 70% for long-term research on hydrogen energy technologies — suitable, but notes that if Congress continues to appropriate significant portions of the overall funding for specific recipients and activities not focused on program goals without increasing overall funding, timing milestones for the program will certainly slip.

[<http://www.nap.edu/books/0309097304/html/>]

◆ Childhood Obesity: Focus on Schools

The Institute of Medicine (IOM), through its Food and Nutrition Board and with support from The Robert Wood Johnson Foundation, is undertaking a study to design a dissemination effort that will assess progress in obesity prevention actions and promote the implementation of the findings and recommendations for the IOM report, Preventing Childhood Obesity: Health in the Balance. The IOM committee is organizing three regional meetings during 2005 to galvanize obesity prevention efforts of local, state, and national decision-makers, community and school leaders, grass-roots organizations, and industry including the food, beverage, restaurant, leisure, and entertainment industries. In collaboration with the Kansas Health Foundation, the IOM held the study’s first regional symposium in Wichita, Kansas on June 27-28, 2005. This first symposium focused on the IOM report recommendations for schools and stakeholders in the school setting to explore how to create a healthy school environment. Recurring themes for accelerating change and moving forward with obesity prevention efforts that emerged from the symposium include: forging strategic partnerships; empowering local schools and communities; educating stakeholders; evaluating obesity prevention efforts; documenting the benefits of obesity prevention; innovating to address barriers; using a systems approach; and developing a long-term strategic plan.

[<http://www.nap.edu/books/0309100402/html/>]

Supporting Science by Communicating It

[The following is excerpted from remarks by Ralph J. Cicerone, new president of the National Academies, in InFocus Magazine, Fall 2005.]

In fields from cosmology through fundamental biology, science is able to map out such mechanisms by observing and explaining phenomena, and it poses new, deeper questions. Science also empowers humans by serving as the basis for beneficial technologies and health care and for wise societal decisions.

The public has been well-rewarded for supporting scientific research and indeed all of higher education. Yet today, recognition of the great rewards that have accrued from science and of potential future benefits is not at all commensurate. We have strong supporters but there is also widespread apathy and, in some quarters, antagonism toward science.

We must improve our communications with the public, to demonstrate better the benefits of science to individuals and to the entire country. Similarly we must assure people that the study of science and mathematics is exciting and important. By building understanding and re-building enthusiasm for science, we can gain political and financial support for science and for higher education.

◆ Medical Device Monitoring Needs a Boost

To ensure the safety of medical devices such as pacemakers, wheelchairs, stents, and other medical technologies after they are put on the market — especially ones used with children — Congress should require the US Food and Drug Administration (FDA) to establish a better system for postmarket monitoring, says a new report from the Institute of Medicine. The report calls on Congress to bolster the FDA’s authority to require manufacturers to conduct postmarket safety studies for certain categories of devices. Because children’s growth spurts and developmental changes can occur over many years, studies of devices used with children should not be limited to the typical three years, the study finds, adding that the agency also needs to monitor more carefully the status of these studies. In addition, the FDA needs to share publicly the data collected. The FDA should encourage health care providers and patients and their families to submit reports about problems associated with devices. Patients, families, and others involved in patient care may not know that they can report problems to FDA or that the agency has a safety checklist for using medical devices at home.

[<http://www.nap.edu/books/0309096316/html/>]

◆ Educating America’s Engineers: The Vital Role of the Nation’s Community Colleges

Community colleges are essential to the schooling of many of the nation’s engineers, says a new report from the National Academy of Engineering and the National Research Council, but this educational pipeline is operating beneath its capacity. Four-year institutions should work more closely with community colleges to recruit, retain, and train students seeking bachelor’s or advanced degrees in engineering. Successful partners communicate frequently, visit each other’s campuses, discuss changes in curricula, and sometimes share faculty, says the report, which includes descriptions of stellar programs and practices. Two- and four-year schools that team up for this purpose also should have clear, effective “articulation agreements” — programs and policies to foster seamless transfers of community college students to four-year colleges or universities. These agreements should focus on student outcomes, such as mastery of important skills. Educators, legislators, and industry representatives should pay more attention to the pool of prospective engineers at community colleges, the report says. Two-year institutions attract many minority and female students, making community colleges good places for initiatives to increase diversity in the nation’s engineering work force.

[<http://www.nap.edu/books/0309095344/html/>]

Biodiversity (continued from page 2)

been successfully grappling with the challenge of fostering high-quality development without destroying the character of a region.

A sense of appreciation of nature must be fostered, says David Wagner, associate professor of ecology and evolutionary biology at UConn. He is another key exponent of BioBlitz.

Science teacher Jeff Sacks of Valley Regional High School in Deep River underscores the importance of exposing young students to real scientists at work. With their innate love of animals, children are especially receptive, he notes. Sacks thinks the BioBlitz concept should be expanded to more towns, so that more students will have the chance to see working scientists in action.

While the work of these scientists in the field can be hot, sweaty, dirty, and exposed to the elements, there's also a sense of glamour associated with it. It's the antithesis of sitting at a desk in a cubicle.

Yet, the process today also involves state-of-the-art technology: digital cameras, global positioning devices, electron microscopes and other equipment that provides a close-up look into the phenomena of life at every level — from outer space to the subatomic.

Edmund Smith concurs with Sacks. "We want to get across the idea that there's tremendous adventure right outside in your own back yard," he says. "You don't need to sit in your living room watching a nature show on cable!"

Despite the wonders of modern science, there is much still to learn about the host of interconnecting biological systems that make up the world and that sustains life.

As Wesleyan University ecologist Geoffrey A. Hammerson writes, in his newly published compendium entitled *Connecticut*

ADDITIONAL RESOURCES ON BIODIVERSITY

The University of Connecticut's Natural History Museum
[<http://www.cac.uconn.edu/>]

The Virtual Collection at the University of Connecticut
[<http://collections2.eeb.uconn.edu/collections/chp.html>]

How Your Town Can Set Up a BioBlitz
[<http://web.uconn.edu/mnh/bioblitz/BioBlitzLinks.html>]

Wildlife: Biodiversity, Natural History, and Conservation: "Our knowledge of the natural world is actually quite rudimentary." He notes, "The living world is dynamic... Most of today's patterns and processes are in a state of flux."

Hammerson's work is not a field guide but rather, a detailed overview of wildlife in the state. It asks the questions: What are the basic characteristics of the major ecosystems? Which ones are in need of conservation attention?

Hammerson came to Connecticut in 1984. With a fresh approach and the excitement of a naturalist, he says "I've tried to learn as much as possible about... Connecticut's hills, valleys, wetlands, and waters."

People have an impact on that environment. As Hammerson writes: "There are few places where human influence cannot be readily seen...unfortunately, human impacts tend strongly toward biological impoverishment."

Through the success of programs such as BioBlitz, today's scientists are engaging the imaginations of Connecticut's students as they raise awareness of the critical role of preserving the state's remarkable biodiversity. — **Linda Case** [*Linda Case is a freelance writer from Wethersfield.*]

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