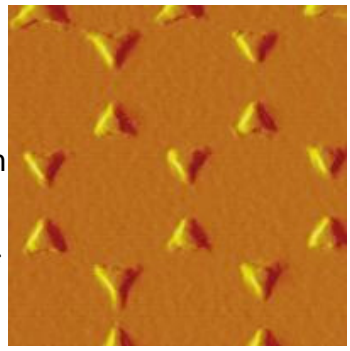
## As nanotech goes mainstream, 'toxic socks' raise concerns



***A biosensor made from an array of silver nanoparticles deposited on glass.***

NEW ORLEANS, April 6, 2008—Nanotechnology is now available in a store near you.

Valued for it's antibacterial and odor-fighting properties, nanoparticle silver is becoming the star attraction in a range of products from socks to bandages to washing machines. But as silver's benefits propel it to the forefront of consumer nanomaterials, scientists are recommending a closer examination of the unforeseen environmental and health consequences of nanosilver.

"The general public needs to be aware that there are unknown risks associated with the products they buy containing nanomaterials," researchers Paul Westerhoff and Troy M. Benn said in a report scheduled for the 235th national meeting of the American Chemical Society (ACS).

Westerhoff and Benn report that ordinary laundering can wash off substantial amounts of the nanosilver particles from socks impregnated with the material. The Arizona State researchers suggest that the particles, intended to prevent foot odor, could travel through a wastewater treatment system and enter natural waterways where they might have unwanted effects on aquatic organisms living in the water and possibly humans, too.

"This is the first report of anyone looking at the release of silver from this type of manufactured clothing product," said the authors.

Behind those concerns lies a very simple experiment. Benn and Westerhoff bought six pairs of name brand anti-odor socks impregnated with nanosilver. They soaked them in a jar of room temperature distilled water, shook the contents for an hour and tested the water for two types of silver — the harmful "ionic" form and the less-studied nanoparticle variety.

"From what we saw, different socks released silver at different rates, suggesting that there may be a manufacturing process that will keep the silver in the socks better," said Benn. "Some of the sock materials released all of the silver in the first few washings, others gradually released it. Some didn't release any silver." The researchers will present the specific brands they studied at their ACS presentation.

If sufficient nanosilver leeches out of these socks and escapes waste water treatment systems into nearby lakes, rivers and streams, it could damage aquatic ecosystems, said Benn. Ionic silver, the dissolved form of the element, does not just attack odor-causing bacteria. It can also hijack chemical processes essential for life in other microbes and aquatic animals.

"If you start releasing ionic silver, it is detrimental to all aquatic biota. Once the silver ions get into the gills of fish, it's a pretty efficient killer," said Benn. Ionic silver is only toxic to humans at very high levels. The toxicity of nanoparticle silver, said Westerhoff, has yet to be determined.

Westerhoff and Benn did not intend to establish the toxicity of silver. "The history of silver and silver regulation has been set for decades by the U. S. Environmental Protection Agency — we're not trying to reexamine or reinvent that," said Westerhoff.

They do hope to spark a broader examination of the environmental and health consequences of nanomaterials, as well as increasing awareness of nanotechnology's role in everyday consumer goods.

Silver has been used historically since ancient roman times, though its nanoparticle form has only recently appeared in consumer products. Beyond socks, nanosilver appears in certain bandages, athletic wear and cleaning products. Benn suggested that most consumers are unaware of these nano-additions.

"I've spoken with a lot of people who don't necessarily know what nanotechnology is but they are out there buying products with nanoparticles in them. If the public doesn't know the possible environmental disadvantages of using these nanomaterials, they cannot make an informed decision on why or why not to buy a product containing nanomaterials," said Benn.

To that end, the researchers suggest that improved product labeling could help. Westerhoff proposes that clothing labels could become like the back of a food packaging, complete with a list of "ingredients" like nanosilver.

Westerhoff and Benn expect to expand their leeching experiments to other consumer products imbued with nanomaterials. They hope to find the moment in each product's lifecycle when nanomaterials could be released into the environment, as well as developing better detection methods to characterize nanoparticles in water and air samples.

"Our work suggests that consumer groups need to start thinking about these things," said Benn. "Should there be other standards for these products."

# Meteorites delivered the 'seeds' of Earth's left-hand life

NEW ORLEANS, April 6, 2008—Flash back three or four billion years — Earth is a hot, dry and lifeless place. All is still. Without warning, a meteor slams into the desert plains at over ten thousand miles per hour. With it, this violent collision may have planted the chemical seeds of life on Earth.

Scientists presented evidence today that desert heat, a little water, and meteorite impacts may have been enough to cook up one of the first prerequisites for life: The dominance of "left-handed" amino acids, the building blocks of life on this planet.

In a report at the 235th national meeting of the American Chemical Society, Ronald Breslow, Ph.D., University Professor, Columbia University, and former ACS President, described how our amino acid signature came from outer space.

Chains of amino acids make up the protein found in people, plants, and all other forms of life on Earth. There are two orientations of amino acids, left and right, which mirror each other in the same way your hands do. This is known as "chirality." In order for life to arise, proteins must contain only one chiral form of amino acids, left or right, Breslow noted.

"If you mix up chirality, a protein's properties change enormously. Life couldn't operate with just random mixtures of stuff," he said.

With the exception of a few right-handed amino acid-based bacteria, left-handed "L-amino acids" dominate on earth. The Columbia University chemistry professor said that amino acids delivered to Earth by meteorite bombardments left us with those left-handed protein units.

"These meteorites were bringing in what I call the 'seeds of chirality,'" stated Breslow. "If you have a universe that was just the mirror image of the one we know about, then in fact, presumably it would have right-handed amino acids. That's why I'm only half kidding when I say there is a guy on the other side of the universe with his heart on the right hand side."

These amino acids "seeds" formed in interstellar space, possibly on asteroids as they careened through space. At the outset, they have equal amounts of left and right-handed amino acids. But as these rocks soar past neutron stars, their light rays trigger the selective destruction of one form of amino acid. The stars emit circularly polarized light—in one direction, its rays are polarized to the right. 180 degrees in the other direction, the star emits left-polarized light.

All earthbound meteors catch an excess of one of the two polarized rays. Breslow said that previous experiments confirmed that circularly polarized light selectively destroys one chiral form of amino acids over the other. The end result is a five to ten percent excess of one form, in this case, L-amino acids. Evidence of this left-handed excess was found on the surfaces of these meteorites, which have crashed into Earth even within the last hundred years, landing in Australia and Tennessee.

Breslow simulated what occurred after the dust settled following a meteor bombardment, when the amino acids on the meteor mixed with the primordial soup. Under "credible prebiotic conditions"— desert-like temperatures and a little bit of water — he exposed amino acid chemical precursors to those amino acids found on meteorites.

Breslow and Columbia chemistry grad student Mindy Levine found that these cosmic amino acids could directly transfer their chirality to simple amino acids found in living things. Thus far, Breslow's team is the first to demonstrate that this kind of handedness transfer is possible under these conditions.

On the prebiotic Earth, this transfer left a slight excess of left-handed amino acids, Breslow said. His next experiment replicated the chemistry that led to the amplification and eventual dominance of left-handed amino acids. He started with a five percent excess of one form of amino acid in water and dissolved it.

Breslow found that the left and right-handed amino acids would bind together as they crystallized from water. The left-right bound amino acids left the solution as water evaporated, leaving behind increasing amounts of the left-amino acid in solution. Eventually, the amino acid in excess became ubiquitous as it was used selectively by living organisms.

Other theories have been put forth to explain the dominance of L-amino acids. One, for instance, suggests polarized light from neutron stars traveled all the way to earth to "zap" right-handed amino acids directly. "But the evidence that these materials are being formed out there and brought to us on meteorites is overwhelming," said Breslow.

The steps afterward that led towards the genesis of life are shrouded in mystery. Breslow hopes to shine more light on prebiotic Earth as he turns his attention to nucleic acids, the chemical units of DNA and its more primitive cousin RNA.

"This work is related to the probability that there is life somewhere else," said Breslow. "Everything that is going on on Earth occurred because the meteorites happened to land here. But they are obviously landing in other places. If there is another planet that has the water and all of the things that are needed for life, you should be able to get the same process rolling."

## Alligator blood may put the bite on antibiotic-resistant infections

NEW ORLEANS, April 6, 2008 — Despite their reputation for deadly attacks on humans and pets, alligators are wiggling their way toward a new role as potential lifesavers in medicine, biochemists in Louisiana reported today at the 235th national meeting of the American Chemical Society. They described how proteins in gator blood may provide a source of powerful new antibiotics to help fight infections associated with diabetic ulcers, severe burns, and "superbugs" that are resistant to conventional medication.

Their study, described as the first to explore the antimicrobial activity of alligator blood in detail, found a range of other promising uses for the gator's antibiotic proteins. Among them: combating Candida albicans yeast infections, which are a serious problem in AIDS patients and transplant recipients, who have weakened immune systems, the scientists say.

"We're very excited about the potential of these alligator blood proteins as both antibacterial and antifungal agents," says study co-author Mark Merchant, Ph.D., a biochemist at McNeese State University in Lake Charles, La. "There's a real possibility that you could be treated with an alligator blood product one day."

Previous studies by Merchant showed that alligators have an unusually strong immune system that is very different from that of humans. Unlike people, alligators can fight microorganisms such as fungi, viruses, and bacteria without having prior exposure to them. Scientists believe that this is an evolutionary adaptation to promote quick wound healing, as alligators are often injured during fierce territorial battles.

In collaboration with Kermit Murray and Lancia Darville, both of Louisiana State University in Baton Rouge, Merchant and colleagues collected blood samples from American alligators. They then isolated disease-fighting white blood cells (leucocytes) and extracted the active proteins from those cells.

In laboratory tests, tiny amounts of these protein extracts killed a wide range of bacteria, including MRSA (methicillin-resistant Staphylococcus aureus), the deadly bacteria that are moving out of health care settings and into the community. These "superbugs" are increasingly resistant to multiple antibiotics and cause thousands of deaths each year.

The proteins also killed six out of eight different strains of Candida albicans, the researchers say. Their previous research also suggests that blood proteins may help fight HIV, the virus that causes AIDS.

The scientists are working to identify the exact chemical structures of the antimicrobial proteins and determine which proteins are most effective at killing different microbes. The gator blood extract may contain at least four promising substances, they estimate.

With the chemical structures in hand, scientists can begin developing them into antibacterial or antifungal drugs, including pills and creams, for fighting infections. These drugs show particular promise as topical ointments, Merchant says. Gator-blood creams could conceivably be rubbed onto the foot ulcers of patients with diabetes to help prevent the type of uncontrolled infections that lead to amputations, he says. The creams could also be applied to the skin of burn patients to keep infections at bay until damaged skin can heal, the researcher adds.

Merchant suggests that the proteins might be called "alligacin." If studies continue to show promise, the drugs could land on pharmacy shelves in another seven to ten years, he estimates. Until then, don't try to create your own home-remedies using alligator blood, as raw, unprocessed blood could make you sick or even kill you if injected, the researcher cautions.

Similar antimicrobial substances might also be found in related animals such as crocodiles, Merchant notes. In the future, he plans to study blood samples from alligators and crocodile species throughout the world to test their disease-fighting potential. The state of Louisiana and the National Science Foundation provides funding for this research.

## 1/3 of risk for dementia attributable to small vessel disease, autopsy study shows

Alzheimer's disease may be what most people fear as they grow older, but autopsy data from a long-range study of 3,400 men and women in the Seattle region found that the brains of a third of those who had become demented before death showed evidence of small vessel damage: the type of small, cumulative injury that can come from hypertension or diabetes.

Dr. Thomas Montine, University of Washington, presented the study results at Experimental Biology 2008 in San Diego on April 6. His presentation was part of the scientific program of the American Society for Biochemistry and Molecular Biology (ASBMB).

In the autopsied brains of people who had experienced cognitive decline and dementia, 45 percent of the risk for dementia was associated with pathologic changes of Alzheimer's disease. Another 10 percent of dementia risk was associated with Lewy bodies, neocortical structural changes that indicate a degenerative brain disease known as Lewy Body Dementia, believed by some clinicians to be a variant of Alzheimer's and/or Parkinson's disease. But a third of the risk for dementia (33 percent) was associated with damage to the brain from small vessel disease.

Dr. Montine and his colleagues believe that, and are now studying in more detail, this small vessel damage is the cumulative effect of multiple small strokes caused by hypertension and diabetes, strokes so small that the person experiences no sensation or problems until the cumulative effect reaches a tipping point. This may be good news, says Dr. Montine. At a time when prevention and treatment for Alzheimer's remain investigational, methods for preventing complications of hypertension and diabetes are currently available.

These findings are very different from both conventional wisdom and from those of most autopsy studies of brain aging and dementia, says Dr. Montine.

Why such different results? Perhaps because of the broad reach of the population on which the autopsy study was based, says Dr. Montine. Most studies looking at the structural changes on autopsy in brains of persons with dementia have focused on participants in Alzheimer's disease center studies or in populations limited to one gender, ethnic or professional group. Individuals in this study were part of the Group Health Cooperative, one of the oldest and largest managed care programs in the United States.

Members in the group who reach 65 with normal cognitive ability are eligible to volunteer for an Adult Changes in Thought (ACT) study, established by Dr. Eric Larson, director of Research at the Group Health Cooperative. ACT participants undergo cognitive, neurological and psychological tests every two years until their death.

Between 1994 and 2006, the period covered by this study, 3,400 men and women entered the ACT study. They were representative of the Seattle urban and suburban area: white, Asian, African American and Hispanic, with a range of educational and professional levels. During this 12-year period, some participants suffered cognitive impairment and dementia, while others did not. Roughly a third of all participants died, and autopsies were performed on the 221 who had given permission for this to be done.

With 55 percent of the risk for dementia attributable to Alzheimer's and Lewy Body Dementia, these findings underscore the therapeutic imperative for developing new pharmacologic and other means of preventing or delaying the onset of Alzheimer's and Lewy Body disease, says Dr. Montine. But the unexpected finding that a third of the risk for dementia is related to small vessel disease also provides an additional reason to control hypertension and diabetes: not only to protect cardiovascular and renal health but also to protect the health of the brain.

## New Study Shows that Fetal Cells Transplanted into the Brain to Treat Parkinson's Disease May Not Function Long Term

### *Disease Pathology Found in Implanted Neurons*

CHICAGO – Neurons grafted into the brain of a patient with Parkinson's disease fourteen years ago have developed Lewy body pathology, the defining pathology for the disease, according to research by Jeffrey H. Kordower, PhD, and associates and published in the April 6 issue of Nature Medicine.

The finding suggest that Parkinson's disease is an ongoing process that can affect cells grafted into the brain in the same way the disease affects host dopamine neurons in the substantia nigra of the brain, according to Kordower, who is the lead author of the study and a neuroscientist at Rush University Medical Center.

"These findings give us a bit of pause for the value of cell replacement strategy for Parkinson's disease," said Kordower. "We still need to vigorously investigate this approach among the full armament of surgically-delivered Parkinson's disease therapies. While it is not clear to us whether the same fate would befall stem cell grafts, the next generation of cell replacement procedures, this study does suggest that grafted cells can be affected by the disease process."

The collaborative research study described in the article involves Rush, Mt. Sinai School of Medicine, New York, and the University of South Florida, Tampa, In it, individuals with Parkinson's disease received fetal cell transplants to reverse the loss in the brain of striatal dopamine.

The individual described in this article was a woman with a 22-year history of Parkinson's disease who underwent transplantation in 1993. After transplantation she experienced improvements in disease symptoms as measured by the Unified Parkinson Disease Rating Scale (UPDRS) and required substantially lower doses of antiparkinsonian medications. Her UPDRS scores remained improved into1997, but by 2004, she experienced progressive worsening of Parkinson's disease symptoms. She died in 2007 and her brain and that of two other patients in the study were comprehensively processed and analyzed. She had the longest survival after transplantation that had been reported to date among this study's participants.

Double-blind, sham-controlled studies that followed did not establish clinical benefit although significant improvement was observed in a subpopulation of patients. Post mortem studies of individuals in these studies showed a robust survival of grafted neurons, suggesting that the cells were not affected by Parkinson's disease as Kordower explains "Because Parkinson's disease pathology progresses over decades, we think that the individuals did not live long enough for the Parkinson's disease pathology to develop in the grafted cells."

Scientists have long debated whether Parkinson's disease results from an acute insult or event, or whether it is an ongoing pathological process that continues to affect healthy neurons, according to Kordower. This research indicates that mechanisms and molecules responsible for initiating the degenerative process are still present at a late stage and are capable of affecting grafted neurons. In addition, the processes that destroy dopamine neurons are not restricted to the midbrain.

"The findings also suggest that there may be either a pathogenic factor in the brain that affects dopamine producing neurons or a pathological process that can spread from one cellular system to another," said Kordower. "These findings have striking implications for understanding what causes PD and the potential for cell replacement strategies to reverse the motor symptoms."

The study is available online at http:/www.nature.com/naturemedicine

The Rush news release is available online at http:/www.rush.edu

## Caffeine prevents multiple sclerosis-like disease in mice

Mice given caffeine equivalent to a human drinking six to eight cups of coffee a day were protected from developing experimental autoimmune encephalomyelitis (EAE), the animal model for the human disease Multiple Sclerosis (MS), according to researchers at Cornell University.

Caffeine is a well-known adenosine receptor blocker, and the researchers believe results show the importance of this molecule in permitting the infiltration of immune cells into the central nervous system of patients with MS.

Dr. Jeffrey H. Mills, a postdoctoral associate in the laboratory of Dr. Margaret S. Bynoe, presented the findings at Experimental Biology 2008 on April 7. The presentation was part of the scientific programs of the American Society of Immunologists.

Multiple sclerosis is an autoimmune disease of the central nervous system (CNS) that occurs when the body's immune system attacks and damages nerves in the brain and spinal cord. The infiltration of immune cells into brain and other CNS tissue is rarely seen in healthy individuals without MS. What allows the immune cells to infiltrate the CNS tissue of patients with MS is unknown. In earlier work, the Bynoe laboratory became convinced that the molecule adenosine is responsible for this infiltration.

Adenosine is widely present in the body and plays an important role in many biochemical processes, such as energy transfer and the promotion of sleep and suppression of arousal. The researchers' first studies found that mice that lacked CD73, the enzyme necessary for synthesizing extracellular adenosine, were protected from developing the mouse form of MS (experimental autoimmune encephalomyelitis or EAE).

Additional studies involving immune cells from mice that lack CD73 further convinced them that normal CD73's ability to synthesize extracellular adenosine was what was important for development and progression of the MS-like disease. That helped explain the presence of adenosine near the cells, but how did the compound get into the CNS cells? Since adenosine must bind to its receptor in order to affect a cell, the researchers reasoned that perhaps adenosine receptor activation was what allowed for entry of immune cells into the brain and spinal cord. To test that idea in the study presented at Experimental Biology 2008, they turned to caffeine.

Caffeine's stimulatory effects on the CNS are in large part due to its ability to bind to the same receptors as adenosine, thus blocking adenosine's ability to affect CNS cells. Mice that consumed caffeine in their drinking water were protected from development of EAE, the MS model. Dr. Bynoe concludes that these experiments show that CD73 and adenosine receptor signaling are required for the efficient entry of immune cells into the CNS during the initiation and progression of EAE in mice and, quite possibly, during the development of MS in humans.

Dr. Bynoe adds, "These results might mark the first in a series of discoveries from our lab that could spawn the impetus for the development of adenosine-based therapies for the treatment of MS."

*In addition to Dr. Mills and Dr. Bynoe, coauthors of the paper include Dr. Cynthia Mueller and Dr. Adam Waickman, also of Cornell, and Dr. Linda F. Thompson, at the Oklahoma Medical Research Foundation. This work was funded by the National Institutes of Health.*

## A landmark law for open access to biomedical research

Starting April 7th, all research articles funded by the National Institutes of Health (NIH) must be submitted to the NIH's public digital library of full-text articles, PubMedCentral (PMC), and made freely available no later than 12 months after publication. This week in the open-access journal PLoS Biology, Founder of the Public Library of Science (PLoS) and Chairman of the Board Harold Varmus applauds the new NIH policy as a landmark event.

With the new policy, the NIH joins the Wellcome Trust, the European Research Council, the Howard Hughes Medical Institute, and other funding agencies in requiring their investigators to deposit publications in PMC or equivalent public libraries, such as UKPMC, within six months to a year. With NIH-supported investigators publishing some 80,000 papers a year, many of them in journals that currently do not contribute

their articles to PMC, the library will soon grow at about twice its already impressive rate--markedly increasing the number of articles freely available to read online.

"The new NIH policy is especially gratifying to those of us who founded the Public Library of Science eight years ago with the goal of promoting greater access to and better use of the scientific literature through libraries like PMC," Varmus writes. Yet much work remains, he argues. While the NIH policy drastically increases the ability for scientists to have their work read and cited, by both the public and other researchers, Varmus argues, "the public libraries and the laudable new policies from funding agencies still fall short of the full potential envisioned for the digital world of science."

Making articles available 6 to 12 months after their publication means the collection is primarily an archival tool, rather than a current resource. Furthermore, public access to research will not be comprehensive. The policy is not retroactive, and the large section of research not funded by the NIH remains largely closed-access. Even for NIH-funded research, unless authors negotiate copyright ownership with publishers, Varmus argues, "journals will continue to retain inappropriate control over the use of their articles."

Still, the NIH policy--along with the recent unanimous vote by the Harvard University Faculty of Arts and Sciences to require its members to post all their accepted articles on an openly accessible, university-maintained Web site--represents a significant shift in scientific publishing toward greater access to the literature.

"When costs of publication are recovered from publishing fees instead of from subscriptions, and when authors retain copyrights and grant licenses to publishers, both of which happen with open-access publishing," Varmus writes, "then articles can be placed immediately in open university repositories (or in public libraries) without threats to revenues or infringements of ownership. We at PLoS celebrate these principles, while also applauding the new policies at Harvard, the NIH, and elsewhere, as welcome signs of continued progress toward public access to research literature."

*Citation: Varmus H (2008) Progress toward public access to science. PLoS Biol 6(4): e101. doi:10.1371/journal.pbio.0060101*

## Genes trigger phobias in kids and teens

* 21:00 07 April 2008
* NewScientist.com news service

*** Jim Giles**

Our response to the things that scare us, from threatening men on dark streets to hairy spiders in the bath, is programmed to become active at different times in our lives, suggest two studies on the genetics of fear.

Scientists already know that fears and phobias are shaped in part by genes. Identical twins, for example, are more likely to develop phobias for the same objects, such as snakes or rats, than non-identical twins. But less is known about when the genes involved act and what effect they have.

In the case of spiders, that effect may be hard-wired from birth.

David Rakison of Carnegie Mellon University in Pittsburgh, Pennsylvania, showed five-month-old babies simple representations of spiders, made up from block-like shapes, as well as more jumbled images made from the same shapes. The babies looked at the schematic spiders for an average of 24 seconds, but spent around 8 seconds less on the more jumbled images.

**Arachnogenes**

This suggests babies are born with a "mental template" for spider shapes, and potentially for other things that may harm them, say Rakison and his colleague Jaime Derringer of the University of Minnesota, Minneapolis, as it is unlikely that the babies developed a specific interest in spiders in the few months they had been alive.

For safe objects, that template appears to be missing. When Rakison repeated the experiment using a representation of a flower and a jumbled equivalent made from the same shapes, the babies looked at all the images for around the same length of time.

Once identified, spiders produce fear and disgust in many people. But that reaction, and the genes that shape it, change during our youth, according to a separate study by Kenneth Kendler of Virginia Commonwealth University in Richmond and colleagues.

They tracked a group of around 1250 pairs of twins, both identical and non-identical, through childhood and adolescence and used questionnaires to ask about the things that scared them.

Since twins grow up in similar environments, genes and environment play comparable roles in determining their fears. So if identical twins are more similar than non-identical twins, then that similarity can be attributed to their identical genes rather than the environment.

**University of life**

Kendler's team found that the genetic effect fluctuated as the children grew up. The genetic contribution to fears relating to blood and injuries peaked between ages 13 and 17, for instance.

The results do not say why different genes act at different times, but Kendler notes that a plausible explanation comes from the fact that our ancestors faced different kinds of threats at different points in their lives.

Getting lost in the dark might have been the most dangerous thing for a four-year-old, for instance. A young adult need not worry so much about getting lost, but would have had to fear strangers, since he or she would have been at risk of being attacked by members of another tribe.

Kendler's study confirms previous work showing that fears and phobias have a substantial heritable component, says Elliot Nelson, a psychiatrist at Washington University in St Louis, Missouri.

The results also show that clinicians may be able to prevent fears becoming ingrained by intervening at critical points during a child's development.

"It is extremely important for clinicians, particularly those working with children and adolescents, to remember that a patient's worldview is very dynamic during these important developmental periods," says Nelson. *Journal references: Cognition, vol 107, p 381; Archives General Psychiatry, vol 65, p 421*

## World's only lungless frog leaves scientists gasping

* 16:44 07 April 2008
* NewScientist.com news service
* Catherine Brahic

An unassuming little frog from Borneo has been found to have an exceedingly rare anatomical feature – introducing Barbourula kalimantanensis, the only known frog with no lungs.

The Bornean flat-headed frog gets all of its oxygen through its skin. Local gold-mining operations, however, are fast polluting the streams where the frog lives.

***The Bornean flat-headed frog, Barbourula kalimantanensis lives in fast-flowing streams and is the only known lungless frog* (Image: D. Bickford)**

A single specimen of Barbourula was described in the 1970s, but biologists had no idea, until now, that the frog had no lungs.

"I was just going to be happy if we simply rediscovered the frogs," says David Bickford of the National University of Singapore. "Most of what we presume is the frog's original range is completely uninhabitable due to illegal gold mining and land conversion."

**Rare adaptation**

Lunglessness is extremely rare in amphibians because, although the animals breathe through their skin, the method delivers only a fraction of the oxygen provided by lungs. It is only practical for cold-blooded animals, which use far less energy than mammals.

One family of salamanders and one species of caecilians are the only other lungless amphibians. There are no known lungless reptiles.

Bickford and his colleagues think that air-filled lungs may have made it difficult for Barbourula's ancestors to sink to the riverbed through fast-flowing water, so it evolved towards a lungless existence.

The clear, cold, fast-flowing streams they live in made this change possible. In the same way cold carbonated drinks hold more "fizz", cold water can hold more dissolved oxygen. And the rapidly flowing streams send a plentiful supply of the oxygen-rich water over the frog's body.

**Collector threat**

But deforestation and illegal gold mining is making the streams warm and sluggish – hostile habitat for the Bornean flat-headed frog.

"We should do all we can to conserve this novel species," says James Collins, co-chair of the International Union for the Conservation of Nature's Amphibian Specialist Group. "These rare biological insights have the capacity to give us a much deeper and richer understanding of the evolution of life on Earth."

"This is an endangered frog that we know practically nothing about with an amazing ability to breathe entirely through its skin, whose future is being destroyed by illegal gold mining by people who are marginalised and have no other means of supporting themselves," says Bickford. "There are no simple answers to this problem."

Bickford's team have no idea how many frogs remain and are not revealing where the two known populations are to be found, fearing that collectors might poach them.

*Journal reference: Current Biology (vol 18, p 7)*

## Backpack Straps Can Decrease Blood Flow In The Shoulder And Arm

***Adult backpacks weighing 26 pounds or more may also lead to a loss in fine motor control and an increase in fatigue***

SAN DIEGO, CA – More than 92 percent of the children in the U.S. carry backpacks. Typically the backpacks are loaded with almost one-fourth of the child's body weight (22 percent) and worn with only one strap. Last year, a team of physician researchers examined the effect heavy-loaded backpack straps can have on children. They

found the straps can significantly increase pressure when the load is ten percent or more. They also found that strap pressures with loads as small as ten percent of bodyweight can obstruct localized blood flow and contribute to shoulder fatigue.

This year the team has examined pack straps and adults. In some professions, such as the military, firefighting and mountain rescue, the packs may equal as much as 60 percent of adult body weight. The findings of the most recent study indicate that even light loads of 26 pounds can decrease upper extremity blood flow, and may result in a loss of fine motor control and increased fatigue.

***Study Being Presented at the 121st Annual Meeting of the American Physiological Society***

The studies were conducted by Timothy Neuschwander, Brandon Macias and Alan Hargens, all of the Department of Orthopaedic Surgery, University of California–San Diego. Dr. Neuschwander will present the team's findings, Backpack Straps Decrease Upper Extremity Blood Flow, at the 121st Annual Meeting of the American Physiological Society (APS; www.the-APS.org/press), part of the Experimental Biology 2008 scientific conference.

**Background and Study Summary**

Backpack straps typically rest on an area of the body where they may compress the axillary vein which causes abnormally high blood pressure inside the veins and a subsequent decrease of blood flow in the shoulders and arms. The researchers speculated that blood flow of the large and small vessels of the upper extremity area would decrease in an individual while wearing a backpack.

To test their theory, they examined eight healthy volunteers, six men and two women between the ages of 18-30. The right brachial artery was measured using ultrasound and the index finger pulp microvascular flow was measured using the photoplethysmography method. Baseline flows were measured immediately before and ten minutes after donning a 26 pound backpack. A ten minute testing period was chosen because people typically wear a backpack for at least ten minutes. This amount of time is also sufficient to measure flood flow.

After wearing the pack for ten minutes, brachial artery blood flow decreased from 2.66± 0.36 to 1.52± 0.27 mL/s ($p<0.05$, paired T-test), and index finger microvascular flow decreased from 100 percent to 46±6 percent ($p<0.05$, paired test).

**Conclusions**

The researchers concluded that backpack loads of just 26 pounds decrease upper extremity macrovascular and microvascular blood flows, and may result in a loss of fine motor control and increased fatigue. According to Timothy Neuschwander, MD, the first author of the study and a physician, "We surmise that the mechanism of diminished blood flow is likely due to strap compression of the axillary vein. We think that backpack straps may benefit from a redesign that skirts the vein leading from the upper extremity to the heart."

## For Some Who Have Lost Their Sense Of Smell, A Once Popular Asthma Drug Could Be Just What The Doctor Ordered

***New study finds that treatment with theophylline improves smell function when biochemistry is the culprit***

SAN DIEGO, CA – Despite the fact that millions of Americans are believed to have lost their sense of smell (hyposmia), no effective method exists to treat many of these people. That is due in part to the fact that the causes of smell loss are varied and complex, ranging from chronic allergies, viral infection, head injury, or no apparent reason at all. Some seven percent of Americans have lost their sense of smell and with it their ability to enjoy the fragrance of flowers, foods and beverages. For individuals whose smell loss relates to the biochemistry of two common proteins, there is some good news. A team of researchers has found that a drug used long ago to help asthmatics can benefit some with smell loss.

**The Study**

The results are contained in a study entitled Effective Treatment of Smell Loss With Theophylline. It was conducted by Robert I. Henkin, Irina Velicu and Loren Schmidt all of the Taste and Smell Clinic, Center for Molecular Nutritional Sensory Disorders, Washington, DC. Dr. Henkin will present his team's findings at the 121st annual meeting of the American Physiological Society (APS; www.the-APS.org/press), part of the Experimental Biology 2008 scientific conference.

A total of 369 individuals were enrolled in the study. Of the total, 314 had smell loss and 55 did not; 169 were female and 145 were male. The participants were 53 years of age ± 1 year. Smell loss was measured using standard testing procedures to determine the type, degree and character of smell loss. These included objective smell function (psychophysical) and subjective (quantitative evaluation of smell loss) methods. Blood measures and smell function were evaluated regularly throughout the study.

The researchers had previously discovered that decreased levels of two proteins – cyclic AMP (cAMP) and cyclic GMP (cGMP) – in nasal mucus inhibited growth and development of olfactory receptor cells and thus caused smell loss. For this reason, patients consumed 200, 400 or 600 mg of theophylline (correlated to blood levels) for a period of 2-6 months.

The drug theophylline is a generalized phosphodiesterase inhibitor. Physicians have determined that the drug is a generalized inhibitor which means it causes certain chemicals like cAMP and cGMP to increase. Thus, the higher the levels of cAMP the greater the ability to smell. This is true to a lesser extent for cGMP. It had been used widely in the l940s and 1950s for the treatment of asthma and has been shown to restore the biochemical problems associated with smell loss in recent years. It has not, however, been approved by the FDA for this purpose.

**Results**

At the end of the study the researchers found that:

* Psychophysical measurements showed that smell function had increased for more than 70 percent of the participants.
* Subjective measurements showed an increase in smelling ability for 47 percent of the participants.
* No correlation in theophylline blood levels changes were evident between those whose smell loss improved and those whose smell level did not improve.
* There were no significant differences in improvement based on gender or age.
* When patients improved and stayed on the drug they continued to improve. Conversely, if they improved their ability to smell then stopped the drug they lost the gains they had made in their ability to smell.

**Conclusion**

According to Dr. Henkin, "It is well known that millions of Americans have smell loss. It is less well known that many of these patients have lower than normal levels of cAMP and cGMP and that theophylline is useful to them since it increases the proteins in the mucus levels of their nasal passages." He continued, "These findings do not relate to all patients with smell loss but to the many who have this biochemical abnormality. In a similar vein, treatment of patients with high cholesterol with cholesterol lowering agents is useful in treatment of heart disease, but there are many causes of heart disease besides elevated cholesterol."

A screening test for those with biochemistry-based smell loss is at: *http://www.tasteandsmell.com/http://www.tasteandsmell.com*.

## Money Doesn't Grow on Trees, But Gasoline Might

***Researchers make breakthrough in creating gasoline from plant matter, with almost no carbon footprint***

Researchers have made a breakthrough in the development of "green gasoline," a liquid identical to standard gasoline yet created from sustainable biomass sources like switchgrass and poplar trees.

Reporting in the cover article of the April 7, 2008 issue of Chemistry & Sustainability, Energy & Materials (ChemSusChem), chemical engineer and National Science Foundation (NSF) CAREER awardee George Huber of the University of Massachusetts-Amherst (UMass) and his graduate students Torren Carlson and Tushar Vispute announced the first direct conversion of plant cellulose into gasoline components.

In the same issue, James Dumesic and colleagues from the University of Wisconsin-Madison announce an integrated process for creating chemical components of jet fuel using a green gasoline approach. While Dumesic's group had previously demonstrated the production of jet-fuel components using separate steps, their current work shows that the steps can be integrated and run sequentially, without complex separation and purification processes between reactors.

While it may be five to 10 years before green gasoline arrives at the pump or finds its way into a fighter jet, these breakthroughs have bypassed significant hurdles to bringing green gasoline biofuels to market.

"It is likely that the future consumer will not even know that they are putting biofuels into their car," said Huber. "Biofuels in the future will most likely be similar in chemical composition to gasoline and diesel fuel used today. The challenge for chemical engineers is to efficiently produce liquid fuels from biomass while fitting into the existing infrastructure today."

For their new approach, the UMass researchers rapidly heated cellulose in the presence of solid catalysts, materials that speed up reactions without sacrificing themselves in the process. They then rapidly cooled the products to create a liquid that contains many of the compounds found in gasoline.

The entire process was completed in under two minutes using relatively moderate amounts of heat. The compounds that formed in that single step, like naphthalene and toluene, make up one fourth of the suite of chemicals found in gasoline. The liquid can be further treated to form the remaining fuel components or can be used "as is" for a high octane gasoline blend.

"Green gasoline is an attractive alternative to bioethanol since it can be used in existing engines and does not incur the 30 percent gas mileage penalty of ethanol-based flex fuel," said John Regalbuto, who directs the Catalysis and Biocatalysis Program at NSF and supported this research.

"In theory it requires much less energy to make than ethanol, giving it a smaller carbon footprint and making it cheaper to produce," Regalbuto said. "Making it from cellulose sources such as switchgrass or poplar trees grown as energy crops, or forest or agricultural residues such as wood chips or corn stover, solves the lifecycle greenhouse gas problem that has recently surfaced with corn ethanol and soy biodiesel."

Beyond academic laboratories, both small businesses and Fortune 500 petroleum refiners are pursuing green gasoline. Companies are designing ways to hybridize their existing refineries to enable petroleum products including fuels, textiles, and plastics to be made from either crude oil or biomass and the military community has shown strong interest in making jet fuel and diesel from the same sources.

"Huber's new process for the direct conversion of cellulose to gasoline aromatics is at the leading edge of the new 'Green Gasoline' alternate energy paradigm that NSF, along with other federal agencies, is helping to promote," states Regalbuto.

Not only is the method a compact way to treat a great deal of biomass in a short time, Regalbuto emphasized that the process, in principle, does not require any external energy. "In fact, from the extra heat that will be released, you can generate electricity in addition to the biofuel," he said. "There will not be just a small carbon footprint for the process; by recovering heat and generating electricity, there won't be any footprint."

The latest pathways to produce green gasoline, green diesel and green jet fuel are found in a report sponsored by NSF, the Department of Energy and the American Chemical Society entitled "Breaking the Chemical and Engineering Barriers to Lignocellulosic Biofuels: Next Generation Hydrocarbon Biorefineries" released April 1 (http://www.ecs.umass.edu/biofuels/). In the report, Huber and a host of leaders from academia, industry and government present a plan for making green gasoline a practical solution for the impending fuel crisis.

"We are currently working on understanding the chemistry of this process and designing new catalysts and reactors for this single step technique. This fundamental chemical understanding will allow us to design more efficient processes that will accelerate the commercialization of green gasoline," Huber said.

## War Between the Sexes Begins Before Twins' Birth, TAU Researchers Say

***"Damage" caused by boys can start in the womb***

The battle of the sexes may begin in the womb, researchers from Tel Aviv University believe. And it may have troubling consequences — a male twin can compromise the health of his twin sister before she is born.

In a new study recently published in the journal Pediatrics, the researchers analyzed the incidence of complications, such as respiratory distress syndrome, found in pre-term twins. When born premature, girls who share the womb with a boy twin lost the respiratory health advantage normally seen in premature girl infants, they discovered.

"The male disadvantage, the study suggests, seems to be transferred from the boy to the girl in utero," says Prof. Brian Reichman, a lecturer in pediatrics at Tel Aviv University's Sackler School of Medicine.

**Girl Twins Lose Their Advantage**

Compared to premature twin boys, premature twin girls had a 60 percent advantage. The premature twin girls tended not to develop respiratory distress syndrome and chronic lung diseases sometimes found in premature infants. This advantage was lost in infant girls with a male twin.

This new study is expected to help pediatricians better understand the health risks and outcome of premature babies.

Prof. Reichman helped analyze the data collected by the Israel Neonatal Network comprising 8,858 very low birth weight infants (1 to 3 pounds) born prematurely at 24 to 34 weeks' gestation. The study data covered infants born between 1995 and 2003 and included singletons, same-sex and mixed-sex pre-term twins.

**Beginning in the Womb**

The TAU study is somewhat unusual. Twin studies tend to focus on what happens after birth, when complicated environmental and learned behavioral factors come into play. "The effects are occurring already in the uterus," says Prof. Reichman, citing studies showing that females with male twins may be more masculinized later in life.

A Pediatrics commentary on the research, "Beware of the Weaker Sex: Don't Get Too Close to Your Twin Brother," by Dr. David K. Stevenson, Department of Pediatrics, Stanford University; and Dr. Jon E. Tyson, Department of Pediatrics, University of Texas Medical School, sums up the findings. "For the time being, there remains some biological truth to the old nursery rhyme that boys are made of 'snakes, snails and puppy dogs' tails,' and 'girls are made of sugar and spice and everything nice.'

"Perhaps nature knows something we do not," Drs. Stevenson and Tyson write.

Researchers conducting this study derived their data from the Israel Neonatal Network, a network of all 28 neonatal departments in Israel. Study co-authors include Professors Eric Shinwell and Isaac Blickstein, both from the Kaplan Medical Center in Rehovot and Hebrew University.

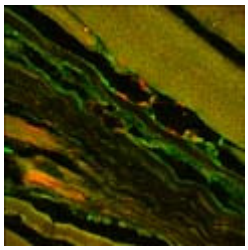
*Prof. Reichman also works at the Sheba Medical Center, Safra Children's Hospital, Tel Hashomer and the Gertner Institute for Epidemiology.*

## UI study finds biological link between pain and fatigue

A recent University of Iowa study reveals a biological link between pain and fatigue and may help explain why more women than men are diagnosed with chronic pain and fatigue conditions like fibromyalgia and chronic fatigue syndrome.

Working with mice, the researchers, led by Kathleen Sluka, Ph.D., professor in the Graduate Program in Physical Therapy and Rehabilitation Science in the UI Roy J. and Lucille A. Carver College of Medicine, found that a protein involved in muscle pain works in conjunction with the male hormone testosterone to protect against muscle fatigue.

***Image of nerve endings in mouse muscle shows that ASIC3 (red) is present in pain receptors (orange).*** **Masahiko Ikeuchi M.D., Ph.D., UI visiting scientist from University of Kochi in Kochi, Japan.**



Chronic pain and fatigue often occur together -- as many as three in four people with chronic, widespread musculoskeletal pain report having fatigue; and as many as 94 percent of people with chronic fatigue syndromes report muscle pain. Women make up the majority of patients with these conditions.

To probe the link between pain and fatigue, and the influence of sex, the UI team compared exercise-induced muscle fatigue in male and female mice with and without ASIC3 -- an acid-activated ion channel protein that the team has shown to be involved in musculoskeletal pain.

A task involving three one-hour runs produced different levels of fatigue in the different groups of mice as measured by the temporary loss of muscle strength caused by the exercise.

Male mice with ASIC3 were less fatigued by the task than female mice. However, male mice without the ASIC3 protein showed levels of fatigue that were similar to the female mice and were greater than for the normal males.

In addition, when female mice with ASIC3 were given testosterone, their muscles became as resistant to fatigue as the normal male mice. In contrast, the muscle strength of female mice without the protein was not boosted by testosterone.

"The differences in fatigue between males and females depends on both the presence of testosterone and the activation of ASIC3 channels, which suggests that they are interacting somehow to protect against fatigue," Sluka said. "These differences may help explain some of the underlying differences we see in chronic pain conditions that include fatigue with respect to the predominance of women over men."

The study, which was published in the Feb. 28 issue of the American Journal of Physiology -- Regulatory, Integrative and Comparative Physiology, indicates that muscle pain and fatigue are not independent conditions and may share a common pathway that is disrupted in chronic muscle pain conditions. The team plans to continue their studies and investigate whether pain enhances fatigue more in females than males.

"Our long-term goal is to come up with better treatments for chronic musculoskeletal pain," Sluka said. "But the fatigue that is typically associated with chronic, widespread pain is also a big clinical problem -- it leaves people unable to work or engage in social activities. If we could find a way to reduce fatigue, we could really improve quality of life for these patients."

*In addition to Sluka, the UI research team included Lynn Burnes, a research assistant and lead author of the study; Sandra Kolker; Jing Danielson; and Roxanne Walder. The study was funded in part by grants from the National Institute of Arthritis and Musculoskeletal and Skin Diseases.*

***STORY SOURCE:*** *University of Iowa Health Science Relations, 5135 Westlawn, Iowa City, Iowa 52242-1178*

## A Disease That Allowed Torrents of Creativity

**By SANDRA BLAKESLEE**

If Rod Serling were alive and writing episodes for "The Twilight Zone," odds are he would have leaped on the true story of Anne Adams, a Canadian scientist turned artist who died of a rare brain disease last year.

Trained in mathematics, chemistry and biology, Dr. Adams left her career as a teacher and bench scientist in 1986 to take care of a son who had been seriously injured in a car accident and was not expected to live. But the young man made a miraculous recovery. After seven weeks, he threw away his crutches and went back to school.

According her husband, Robert, Dr. Adams then decided to abandon science and take up art. She had dabbled with drawing when young, he said in a recent telephone interview, but now she had an intense all-or-nothing drive to paint.

"Anne spent every day from 9 to 5 in her art studio," said Robert Adams, a retired mathematician. Early on, she painted architectural portraits of houses in the West Vancouver, British Columbia, neighborhood where they lived.

In 1994, Dr. Adams became fascinated with the music of the composer Maurice Ravel, her husband recalled. At age 53, she painted "Unravelling Bolero" a work that translated the famous musical score into visual form.

Unbeknown to her, Ravel also suffered from a brain disease whose symptoms were identical to those observed in Dr. Adams, said Dr. Bruce Miller, a neurologist and the director of the Memory and Aging Center at the University of California, San Francisco. Ravel composed "Bolero" in 1928, when he was 53 and began showing signs of his illness with spelling errors in musical scores and letters.

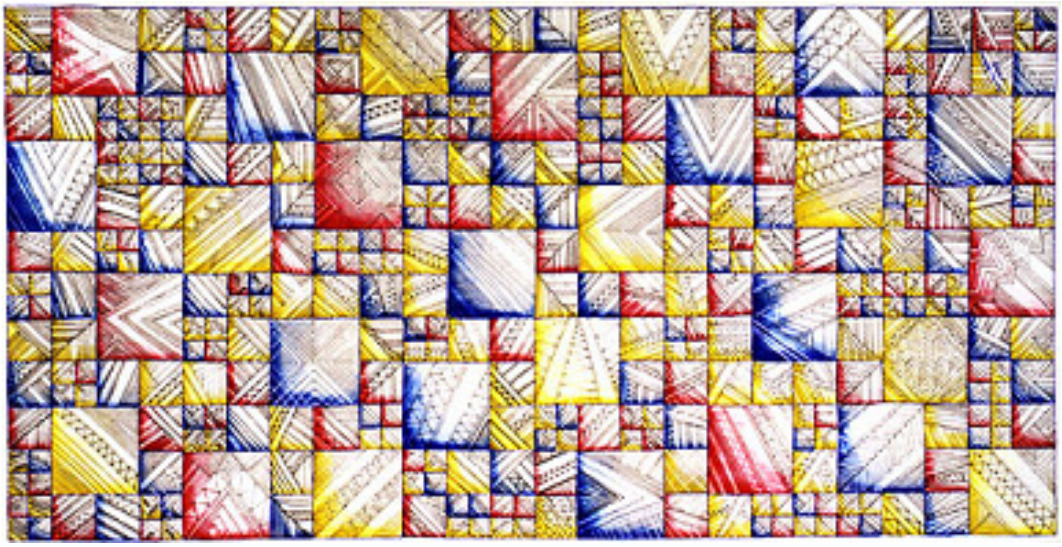


***Image of a migraine by Anne Adams, who was drawn to structure and repetition. She had a rare disease that changes connections between parts of the brain.***

"Bolero" alternates between two main melodic themes, repeating the pair eight times over 340 bars with increasing volume and layers of instruments. At the same time, the score holds methodically to two simple, alternating staccato bass lines.

" 'Bolero' is an exercise in compulsivity, structure and perseveration," Dr. Miller said. It builds without a key change until the 326th bar. Then it accelerates into a collapsing finale.

Dr. Adams, who was also drawn to themes of repetition, painted one upright rectangular figure for each bar of "Bolero." The figures are arranged in an orderly manner like the music, countered by a zigzag winding scheme, Dr. Miller said. The transformation of sound to visual form is clear and structured. Height corresponds to volume, shape to note quality and color to pitch. The colors remain unified until the surprise key change in bar 326 that is marked with a run of orange and pink figures that herald the conclusion.

Ravel and Dr. Adams were in the early stages of a rare disease called FTD, or frontotemporal dementia, when they were working, Ravel on "Bolero" and Dr. Adams on her painting of "Bolero," Dr. Miller said. The disease apparently altered circuits in their brains, changing the connections between the front and back parts and resulting in a torrent of creativity.

"We used to think dementias hit the brain diffusely," Dr. Miller said. "Nothing was anatomically specific. That is wrong. We now realize that when specific, dominant circuits are injured or disintegrate, they may release or disinhibit activity in other areas. In other words, if one part of the brain is compromised, another part can remodel and become stronger."

***Unravelling Boléro by Anne Adams is a bar-by-bar representation of the popular classical piece Boléro by Maurice Ravel***

Thus some patients with FTD develop artistic abilities when frontal brain areas decline and posterior regions take over, Dr. Miller said.

An article by Dr. Miller and colleagues describing how FTD can release new artistic talents was published online in December 2007 by the journal Brain. FTD refers to a group of diseases often misdiagnosed as Alzheimer's disease, in that patients become increasingly demented, Dr. Miller said. But the course and behavioral manifestations of FTD are different.

In the most common variant, patients undergo gradual personality changes. They grow apathetic, become slovenly and typically gain 20 pounds. They behave like 3-year-olds in public, asking embarrassing questions in a loud voice. All along, they deny anything is wrong.

Two other variants of FTD involve loss of language. In one, patients have trouble finding words, Dr. Miller said. When someone says to the patients, "Pass the broccoli," they might reply, "What is broccoli?"

In another, PPA or primary progressive aphasia, the spoken-language network disintegrates. Patients lose the ability to speak.

All three variants share the same underlying pathology. The disease, which has no cure, can progress quickly or, as in the case of Senator Pete V. Domenici, Republican of New Mexico, who announced his retirement last fall because of an FTD diagnosis, over many years.

Dr. Adams and Ravel had the PPA variant, Dr. Miller said.

From 1997 until her death 10 years later, Dr. Adams underwent periodic brain scans that gave her physicians remarkable insights to the changes in her brain.

"In 2000, she suddenly had a little trouble finding words," her husband said. "Although she was gifted in mathematics, she could no longer add single digit numbers. She was aware of what was happening to her. She would stamp her foot in frustration."

By then, the circuits in Dr. Adams's brain had reorganized. Her left frontal language areas showed atrophy. Meanwhile, areas in the back of her brain on the right side, devoted to visual and spatial processing, appeared to have thickened.

When artists suffer damage to the right posterior brain, they lose the ability to be creative, Dr. Miller said. Dr. Adams's story is the opposite. Her case and others suggest that artists in general exhibit more right posterior brain dominance. In a healthy brain, these areas help integrate multisensory perception. Colors, sounds, touch and space are intertwined in novel ways. But these posterior regions are usually inhibited by the dominant frontal cortex, he said. When they are released, creativity emerges. Dr. Miller has witnessed FTD patients become gifted in landscape design, piano playing, painting and other creative arts as their disease progressed.

Dr. Adams continued to paint until 2004, when she could no longer hold a brush. Her art, including "An ABC Book of Invertebrates," a rendering of the mathematical ratio pi, an image of a migraine aura and other works, is at two Web sites: members.shaw.ca/adms and memory.ucsf.edu/Art/gallery.htm.

***Patient Art Gallery From USCF***

## Microsoft creates 'instant backing band' for singers

* 13:24 07 April 2008

* NewScientist.com news service

*** Paul Marks**

Whether you're a frustrated songwriter or a shower-time crooner, you may long to hear your lyrics put to music. New software from Microsoft promises to provide just that – instant musical accompaniment to singing.

The software, called MySong, was developed by Dan Morris and Sumit Basu at Microsoft's research lab in Redmond, Washington, US, and Ian Simon at the University of Washington in Seattle.

"The idea is to let a creative but musically untrained individual get a taste of song writing and music creation," Morris told New Scientist. "There was nothing out there that could take a sung vocal melody as an input and then generate appropriate chords to accompany it." (Watch a video of the process here.)

Their software does two things: it generates a file containing the sequence of sung notes – a process known as "pitch tracking" – then uses that sequence to work out a suitable musical backdrop – a technique called "chord probability computation". Hear an example of vocal input, MySong's automatically generated chords and a full musical arrangement after passing the arrangement through a program called Band-in-a-Box.

**'Elevator music'**

Since people rarely sing at precise frequencies, MySong compares a sung melody to the 12 standard musical notes. It then feeds an approximate sequence of notes to the system's chord probability computation algorithm. This algorithm has been trained, through analysis of 300 rock, pop, country and jazz songs, to recognise fragments of melody and chords that work well together, as well as chords that compliment each another.

Because there is no single "correct" chord accompaniment for any vocal melody, MySong produces a variety of chord sequence and possible accompaniments. To move between different accompaniments, a user slides an on-screen bar for "happy factor" and "jazz factor".

"I suspect musicians will argue that this is another step towards homogenised elevator music for all," says Peter Bentley, a computer scientist at University College London, whose team has previously coaxed computers into improvising jazz melodies. "But I see a big market for this, whether it's liked by musicians or not."

**Cellphone version?**

Researcher and composer Tod Machover of the Massachusetts Institute of Technology is also impressed with the system. "Interacting with a music creation system by using our own singing voice is the most interesting aspect to this software," he says. "The voice is our most intuitive and intimate interface and it's one that has been curiously under-exploited in interactive systems," Machover adds. For MySong to be useful to untrained singers, however, Machover reckons it will need to be very forgiving for those who are "not be perfectly in-tune or accurate".

Microsoft has yet to decide when or how it to market the technology. "There is nothing computationally demanding about MySong," says Morris. "It could even run on a cellphone."

MySong was demonstrated at the annual Computer Human Interaction meeting in Florence, Italy, this week. ***Weblinks Microsoft MySong*** http://research.microsoft.com/~dan/mysong

## Seahorses discovered in the River Thames

* 22:21 07 April 2008
* NewScientist.com news service
*** New Scientist and Reuters**

Marine biologists believe seahorses could be breeding in the UK's River Thames as the water becomes cleaner.

About five short-snouted seahorses (Hippocampus hippocampus) have been spotted during routine conservation surveys over the last year or so, leading scientists to think they have probably established a resident population.

The news has been kept secret until now because the seahorse has not been protected by law. But beginning on Monday, the marine creature and its environment will have protection under the Wildlife and Countryside Act 1981.

The seahorse has been spotted near Dagenham, Tilbury and Southend. It is thought to be mainly a salt water creature, usually found in shallow muddy waters, estuaries or seagrass beds, so it is not clear how far up the Thames it will go.

But the Zoological Society of London, which released its findings, said the discoveries suggested that the Thames was becoming cleaner.

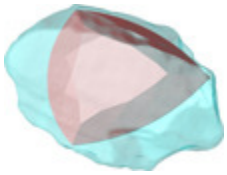
"It demonstrates that the Thames is becoming a sustainable, bio-diverse habitat for aquatic life," said Alison Shaw, manager of the Society's marine and freshwater conservation programme.

"It is not clear how endangered short-snouted seahorses are because there is little data known, particularly in the UK, so every scrap of information is valuable," she said.

There are signs that the seahorse is breeding on the south coast, too.

Other creatures protected by the Act from Monday include the water vole, angel shark, Roman snail and long-snouted seahorse.

## Precise cut for sparkling jewels



Rubies, emeralds and tourmalines can only sparkle with the right cut. Since early this year, a fully automatic machine has undertaken this grinding process for Paul Wild GmbH. It saves up to 30 percent of the precious material and grinds the gems with greater precision.

Not until they are given the right cut do precious stones reveal their true value. And they only fetch the highest prices if the facets are even and exact. However, the grinding process – which has hitherto been performed exclusively by hand – leaves little remaining of the valuable uncut stone: 66 to 70 percent fall to the ground as dust, while only a good 30 percent eventually sparkle in the light as a precious jewel. But which of the numerous cuts will make the most of the raw gemstone in question? Experienced lapidaries have an instinct for it.

For the first time ever, a grinding machine is challenging this collected experience: On average, it uses 15 percent more of the volume of the uncut stone. The machine has been in use with Paul Wild gem-cutters near Idar-Oberstein for three months, and has already transformed over a hundred lumps of rough stone into sparkling gems. “The machine – a CNC grinding machine with 17 axes – first maps the surface of the uncut stone,” explains Dr. Karl-Heinz Küfer, head of department at the Fraunhofer Institute for Industrial Mathematics ITWM in Kaisers-lautern, who developed the software for controlling the machine with the help of his colleagues. “To do this, narrow bands of light are projected fully automatically onto the uncut stone, and its geometry can be determined from their curvature. The computer takes ten minutes to determine the image of the enclosed gemstone awaiting grinding, and sends the appropriate commands to the process control unit. The 17 axes ensure that the milling head can move along any desired path and grind the facets to an accuracy within ten micrometers – the gemstones become perfectly geometrical.” For comparison, hand grinding achieves an accuracy of about 100 micrometers, or the width of a hair. Hand-polished gems appear less exact, their facets and polished edges seeming to be slightly rounded.

The fully automated system takes an average of 20 minutes to give an uncut stone its facets. The machine has to work with extreme care and therefore allows the precious dust to fall rather more slowly than a skilled lapidary who has an instinct for the correct grinding pressure. On no account must the precious stone be allowed to get too hot, as this could cause it to split. During polishing, however, the machine works faster: Whereas the skilled worker repeatedly has to wipe the stone clean and carefully inspect it, the machine sets the polishing time automatically depending on the size of the facets and the type and weight of the gem. “With uncut gems of average quality, the system will pay off within a year or two,” Küfer estimates.

## Microwave treatments for enlarged prostate cause blood pressure surges

***Monitoring, medication continuance needed to reduce cardiovascular risks***

ROCHESTER, Minn. -- Many men who receive microwave therapy for enlarged prostates experience significant surges in blood pressure that could raise their risk of a heart attack or stroke, according to new research findings published recently in Mayo Clinic Proceedings.

The Mayo Clinic-led study of 185 consecutive patients who received transurethral microwave therapy at four medical centers found that 42 percent experienced systolic blood pressure surges of more than 30 mm Hg, while 5 percent had surges of more than 70 mm Hg.

"Men who are candidates for this minimally invasive microwave therapy tend also to be at higher risk for cardiac events," says Lance Mynderse, M.D., the Mayo Clinic urologist who authored the study. "Blood pressure surges of the magnitude identified in this study are troubling side effects of treatment that need to be monitored and managed."

Benign prostatic hyperplasia (BPH), or an enlarged prostate gland, is a condition affecting half of men over age 50 and 80 percent of those over 70. Symptoms include difficult urination, sudden urges to urinate and inability to empty the bladder. BPH often is treated with medication and in severe cases open surgery may be necessary, but since 1997 transurethral microwave therapy has been a less-invasive option.

Transurethral microwave therapy involves using a catheter to place a microwave device within the prostate, which is then heated to destroy excess tissue. Approximately 70,000 such procedures are performed each year, usually in an office setting and typically involving patients from 50 to 85 years old.

"This patient population is at high risk of cardiovascular disease," explains Benjamin Larson, a medical student at Cleveland Clinic who is the lead author of the Mayo Clinic Proceedings paper. "Anecdotal reports of adverse blood pressure events during and after transurethral microwave therapy, and our own experience, led us to look back at the records to identify potential problems among these patients whose blood pressure had been monitored."

The authors say the study findings should not necessarily deter physicians and their patients from using one of the six FDA-approved devices for transurethral microwave therapy, but they should take reasonable precautions given the strong possibility of blood pressure surges. "Blood pressure monitoring should be a standard part of the procedure. Blood pressure readings should be taken throughout the procedure, multiple times. Unfortunately, that has not always been the practice for this office-based therapy," Dr. Mynderse explains. "Monitoring will enable physicians to identify the problem and adjust treatment. Patients also should be encouraged to continue their anti-hypertensive medications, particularly beta blockers, as they prepare for the procedure."

*Besides Larson and Dr. Mynderse, other authors of the paper include Thayne Larson, M.D.; Virend Somers, M.D., Ph.D.; Michael Jaff, D.O. and William Evans, D.O.*

**Well**

## Keeping Priorities Straight, Even at the End

**By TARA PARKER-POPE**

As a professor of computer sciences at Carnegie Mellon University, Randy F. Pausch expected students to pay attention to his lectures. He never expected that the rest of the world would listen, too.

But today, more than 10 million people have tuned into Dr. Pausch's last lecture, a whimsical and poignant talk about Captain Kirk, zero gravity and achieving childhood dreams. The 70-minute talk, at http://www.cmu.edu/randyslecture, has been translated into seven languages, and this week Hyperion is publishing "The Last Lecture," a book by Dr. Pausch and a collaborator, Jeff Zaslow, that tells the story behind the story of the lecture.

"The whole thing is very strange," Dr. Pausch said over lunch at a diner near Norfolk, Va. "I just gave a talk. I gave talks my whole life."

But of course, this wasn't just any talk. "Let's not ignore the obvious," he said. "If I'd given that lecture but I weren't dying, it wouldn't have had the gravitas. Context is everything."

Dr. Pausch, 47, is dying of pancreatic cancer, a disease that kills 95 percent of its victims, usually within months of diagnosis. Except for a pill bottle on the table in front of him, there were no outward signs of the deadly tumors growing inside him. Though he had just recently recovered from heart and kidney failure, he looked boyish, with a red knit shirt and a head of thick dark-brown hair.

Last fall, after doctors told him that he would probably have no more than six months of good health, Dr. Pausch stepped down from his academic duties and relocated to be closer to his family. But he decided to give one last lecture to a roomful of students and faculty members at Carnegie Mellon.

The lecture was not about cancer. Instead, he says, it was simply a father's effort to digest a lifetime of advice for his children into one talk — a talk that Dr. Pausch knew he would not be around long enough to deliver in person. The children are Dylan, 6; Logan, 4; and Chloe, almost 2.

Although he could have set it up on a home video, he liked the idea that one day they would watch his last lecture and see their dad at work, in his element.

"I'm speaking only to them," he said. "I didn't set out to tell the world about how to live life."

After Mr. Zaslow, a Carnegie Mellon alumnus who is a columnist for The Wall Street Journal, wrote about the talk, it quickly became an Internet sensation.


***Scenes from a video of Randy F. Pausch's lecture, made for his children. "I'm speaking only to them," he said.***

With the clarity of thought that perhaps only a person facing death can muster, Dr. Pausch, in his lecture and his book, outlines his recipe for a happy life and achieving dreams.

He talks of reaching his childhood goals of experiencing zero gravity, writing an article in the World Book Encyclopedia, winning giant stuffed animals at amusement parks and being a Disney "imagineer." Much of his talk is about tenacity and how he managed to scale the "brick walls" that stood in the way of achieving some of his dreams. Other lessons are those that all parents hope to teach their children — show gratitude, tell the truth, no job is beneath you.

And he urges parents to let their children draw on the bedroom walls — where the young Randy Pausch painted a quadratic equation, a rocket, an elevator and, from one of his favorite stories, Pandora's box. At the bottom of the box, he added the word "Hope" that a friend later preceded with "Bob."

Dr. Pausch says he is trying to use his unexpected celebrity to draw attention to the lack of financing for pancreatic cancer research. Testifying before Congress on behalf of the Pancreatic Cancer Action Network (www.pancan.org), he showed a picture of his family. "This is my widow," he said pointing to his wife, Jai. "That's not a grammatical construction you get to use every day, but there aren't many diseases where you know it will be fatal."

Because Dr. Pausch has outlived his initial prognosis, a few bloggers have begun to speculate that he is not really dying. Doctors at the M. D. Anderson Cancer Center in Houston and the University of Pittsburgh have confirmed Dr. Pausch's diagnosis and treatment.

"There's nothing to be cynical about in how he's choosing to approach these last months of his life," said Robbee Kosak, vice president for university advancement at Carnegie Mellon. "He's always been very passionate. He's always very pragmatic. He knows exactly what his priorities are. People like Randy are so rare. We should all be really happy that so many of us have had a chance now to see that it's possible to live your life with passion and energy and candor."

Although Dr. Pausch let Diane Sawyer prepare a one-hour special for ABC-TV about his talk and cancer battle that will be broadcast on Wednesday evening, he has turned down movie offers and even declined an approach from a documentary filmmaker. "It was time I didn't have," he said.

Dr. Pausch said that his wife persuaded him to write the book, but that he was worried it would take too much time away from the children. Because he rode his bike every day to keep up his strength, he spoke with his co-writer, Mr. Zaslow, by phone on 53 one-hour bike rides.

The real wisdom of Dr. Pausch is that he tries to enjoy every day he has left with his family, while at the same time trying to prepare them for life without him. To that end, he is videotaping himself spending time with Dylan, Logan and Chloe so they can look back and see how he felt about them.

"I've always said I only care about the first three copies of the book," Dr. Pausch said. "The lessons learned are the lessons I've learned and what worked for me. But so many people wrote to me and said, 'This was a jumping-off point to have conversations with my kids we haven't had.' "

**Personal Health**

# Potential for Harm in Dietary Supplements

**By JANE E. BRODY**

A form of substance abuse rampant in this country is rarely discussed publicly or privately. It involves abusing legally sold dietary supplements — vitamins, minerals, herbals and homeopathic remedies — all of which can be sold over the counter without prior approval for safety and effectiveness.

Although there was much publicity about the hazards of ephedra, once widely used as a weight-loss aid until it was found to be deadly, many other heralded dietary supplements have the potential for harm, especially when taken in large doses or in various combinations with one another or with medically prescribed prescription drugs.

Still other problems can arise when these poorly regulated supplements are taken by people with known or hidden health problems or when patients fail to report their use to health professionals who treat them.

For example, Dr. Richard A. Nathan, a dental surgeon in San Francisco, wrote in January about a patient who needed a tooth extracted and minor periodontal surgery. She told Dr. Nathan that she was taking two drugs, for cholesterol and blood pressure, neither of which he said would present a problem to safe surgery and normal healing.

Thus, Dr. Nathan was perplexed when the patient returned five days later unhealed, with an unattached flap of tissue, severe bleeding and an infection.

"Based on my 30 years of experience, it looked as though the patient was an out-of-control diabetic or had a severely compromised immune system," he told me. "Neither was the case. However, when I asked the patient again what medications she was taking, she admitted that she was on multiple — 18 to be exact — over-the-counter supplements, for a total of 43 pills and capsules a day."

Six of these — green tea, grapeseed, ginkgo biloba turmeric, salmon oil and vitamin E, he said, "are known to increase bleeding due to inhibition of platelet aggregation," the first step in forming a clot. Within a week after discontinuing all supplements, her mouth began to heal normally.

## Problems Not Reliably Reported

While this case may represent an extreme, the problem is by no means an isolated one. No one knows how many such adverse effects befall supplement users, because there has been no reliable reporting system.

A new federal law requires supplement manufacturers to report serious adverse effects to the Food and Drug Administration, but it depends on consumers to call in reactions. Experts say most consumers are unlikely to relate health problems to a supplement they assume to be safe, and even if they do, they may be reluctant to report an adverse effect from a self-medicated substance.

Not so for Michael Alexander of San Francisco. In September, he wrote to Kaiser Permanente that a vitamin supplement he had regularly bought from the Kaiser pharmacy caused years of leg cramps, eventually diagnosed by a neurologist as vitamin B6-induced neuropathy. The supplement had 100 milligrams of B6, or 50 times the recommended daily amount. The ill effect developed even though Mr. Alexander cut each tablet in four parts and took "only" 25 milligrams daily.

According to a 2002 Harris poll, 70 percent of adults in the United States take vitamins, minerals, herbs or other supplements. Their use of supplements has been increasing, fed by the belief that they can make people feel better, give them greater energy, improve health and prevent and treat disease. Although some supplements are beneficial, others may or may not be. Others may be downright dangerous. Even so-called safe supplements can be hazardous in too large amounts or the wrong combinations.

Vitamins A, B6, B12, C, E and K; niacin; folic acid; calcium; magnesium; iron; and zinc can be hazardous when combined with various prescription drugs and over-the-counter remedies. Yet patients often fail to mention using such supplements to physicians.

"Consumers don't realize that there's a big difference between dietary supplements, homeopathic remedies and over-the-counter medications," David Schardt, senior nutritionist for the Center for Science in the Public Interest, a watchdog group in Washington, said in an interview. "They're all sold side by side in stores. Yet there's a vast difference in the evidence for safety and effectiveness that manufacturers must have to sell them."

Over-the-counter medications like ibuprofen, inhalers and reflux inhibitors have to be shown as safe and effective before the F.D.A. will let them be marketed. But thanks to the 1994 Dietary Supplement Health and Education Act, neither dietary supplements nor homeopathic remedies are required to provide premarket evidence of safety and effectiveness. To remove such a product from the market, the F.D.A. has to prove that it is dangerous, a challenging task for the understaffed, budget-strapped agency.

## Homeopathic Medical Claims

Homeopathic remedies slip under an even lower wire. While dietary supplements can make only structure and function claims, products labeled homeopathic — a designation decided by the industry, not the F.D.A. —

can assert medical effects, Mr. Schardt explained. Thus, the homeopathic zinc supplement Cold-EEZE, claims to fight colds, but Cold-fX, sold as a zinc dietary supplement, cannot make such a claim.

Consumers are often swayed by reports of health benefits attributed to various supplements, and assume that they are risk free and can be safely taken in any amount. Although a small dose may be good, more is not necessarily better. In fact, it may be harmful. Megadoses of vitamins or minerals are no longer acting as nutrients but as drugs or, in some cases, as toxic agents.

For example, observational studies of people who eat foods rich in antioxidants like vitamins A and E and beta-carotene have suggested these substances improve health. But well-designed clinical trials found increased death rates among people who take them as supplements. And while low vitamin C doses can suppress harmful free radicals, very high doses promote their formation. The initial promise that vitamin E could protect against heart attacks and cancer failed to stand up to scientific scrutiny, which instead found that it increased the risk of heart failure.

Led by testimonials and articles in health food publications and on the Internet, consumers also tend to confuse structure and function claims with medical benefits. They are not the same. Just because beta-carotene in carrots aids normal vision does not mean it can correct nearsightedness. Or a substance for forming blood cells will not necessarily be useful to prevent or treat a disease of blood-forming tissue like leukemia.

A National Institutes of Health panel in May 2006 noted: "The F.D.A. has insufficient resources and legislative authority to require specific safety data from dietary supplement manufacturers or distributors before or after their products are made available to the public. The constraints imposed on F.D.A. make it difficult for the health of the American public to be adequately protected."

Caveat emptor.

**Findings**

## And Behind Door No. 1, a Fatal Flaw

**By JOHN TIERNEY**

The Monty Hall Problem has struck again, and this time it's not merely embarrassing mathematicians. If the calculations of a Yale economist are correct, there's a sneaky logical fallacy in some of the most famous experiments in psychology.

The economist, M. Keith Chen, has challenged research into cognitive dissonance, including the 1956 experiment that first identified a remarkable ability of people to rationalize their choices. Dr. Chen says that choice rationalization could still turn out to be a real phenomenon, but he maintains that there's a fatal flaw in the classic 1956 experiment and hundreds of similar ones. He says researchers have fallen for a version of what mathematicians call the Monty Hall Problem, in honor of the host of the old television show, "Let's Make a Deal."

Here's how Monty's deal works, in the math problem, anyway. (On the real show it was a bit messier.) He shows you three closed doors, with a car behind one and a goat behind each of the others. If you open the one with the car, you win it. You start by picking a door, but before it's opened Monty will always open another door to reveal a goat. Then he'll let you open either remaining door.

Suppose you start by picking Door 1, and Monty opens Door 3 to reveal a goat. Now what should you do? Stick with Door 1 or switch to Door 2?

Before I tell you the answer, I have a request. No matter how convinced you are of my idiocy, do not immediately fire off an angry letter. In 1991, when some mathematicians got publicly tripped up by this problem, I investigated it by playing the game with Monty Hall himself at his home in Beverly Hills, but even that evidence wasn't enough to prevent a deluge of letters demanding a correction.

**Viktor Koen**

***Even some of the smartest mathematicians initially come up with the wrong answer to the Monty Hall Problem. Perhaps the best way to understand it is to play the game yourself.***

Before you write, at least try a few rounds of the game, which you can do by playing an online version of the game. Play enough rounds and the best strategy will become clear: You should switch doors.

This answer goes against our intuition that, with two unopened doors left, the odds are 50-50 that the car is behind one of them. But when you stick with Door 1, you'll win only if your original choice was correct, which happens only 1 in 3 times on average. If you switch, you'll win whenever your original choice was wrong, which happens 2 out of 3 times.

Now, for anyone still reading instead of playing the Monty Hall game, let me try to explain what this has to do with cognitive dissonance.

For half a century, experimenters have been using what's called the free-choice paradigm to test our tendency to rationalize decisions. This tendency has been reported hundreds of times and detected even in animals. Last year I wrote a column about an experiment at Yale involving monkeys and M&Ms.

The Yale psychologists first measured monkeys' preferences by observing how quickly each monkey sought out different colors of M&Ms. After identifying three colors preferred about equally by a monkey — say, red, blue and green — the researchers gave the monkey a choice between two of them.

If the monkey chose, say, red over blue, it was next given a choice between blue and green. Nearly two-thirds of the time it rejected blue in favor of green, which seemed to jibe with the theory of choice rationalization: Once we reject something, we tell ourselves we never liked it anyway (and thereby spare ourselves the painfully dissonant thought that we made the wrong choice).

But Dr. Chen says that the monkey's distaste for blue can be completely explained with statistics alone. He says the psychologists wrongly assumed that the monkey began by valuing all three colors equally.

Its relative preferences might have been so slight that they were indiscernible during the preliminary phase of the experiment, Dr. Chen says, but there must have been some tiny differences among its tastes for red, blue and green — some hierarchy of preferences.

If so, then the monkey's choice of red over blue wasn't arbitrary. Like Monty Hall's choice of which door to open to reveal a goat, the monkey's choice of red over blue discloses information that changes the odds. If you work out the permutations (see illustration), you find that when a monkey favors red over blue, there's a two-thirds chance that it also started off with a preference for green over blue — which would explain why the monkeys chose green two-thirds of the time in the Yale experiment, Dr. Chen says.

Does his critique make sense? Some psychologists who have seen his working paper answer with a qualified yes. "I worked out the math myself and was surprised to find that he was absolutely right," says Daniel Gilbert, a psychologist at Harvard. "He has essentially applied the Monty Hall Problem to an experimental procedure in psychology, and the result is both instructive and counter-intuitive."

Dr. Gilbert, however, says that he has yet to be persuaded that this same flaw exists in all experiments using the free-choice paradigm, and he remains confident that the overall theory of cognitive dissonance is solid. That view is shared by Laurie R. Santos, one of the Yale psychologists who did the monkey experiment.

"Keith nicely points out an important problem with the baseline that we've used in our first study of cognitive dissonance, but it doesn't apply to several new methods we've used that reveal the same level of dissonance in both monkeys and children," Dr. Santos says. "I doubt that his critique will be all that influential for the field of cognitive dissonance more broadly."

Dr. Chen remains convinced it's a broad problem. He acknowledges that other forms of cognitive-dissonance effects have been demonstrated in different kinds of experiments, but he says the hundreds of choice-rationalization experiments since 1956 are flawed.

Even when the experimenters use more elaborate methods of measuring preferences — like asking a subject to rate items on a scale before choosing between two similarly-ranked items — Dr. Chen says the results are still suspect because researchers haven't recognized that the choice during the experiment changes the odds. (For more of Dr. Chen's explanation, see TierneyLab.)

"I don't know that there's clean evidence that merely being asked to choose between two objects will make you devalue what you didn't choose," Dr. Chen says. "I wouldn't be completely surprised if this effect exists, but I've never seen it measured correctly. The whole literature suffers from this basic problem of acting as if Monty's choice means nothing."

## Use of Information Technology is Minimal in Nursing Homes

### *MU Researcher finds majority of Missouri homes fall short of expected standards*

COLUMBIA, Mo. - In short-term health care settings, sophisticated information technology (IT) systems assist in the diagnosis of patients, support care management, and enhance adherence to clinical guidelines. However, current levels of IT sophistication in U.S. nursing homes are unknown. In response to recent efforts from policy makers to integrate IT in long-term health care, a University of Missouri researcher found, through two different studies, that the current level of IT use in Missouri nursing homes is minimal.

"IT sophistication has been studied extensively in acute care settings, but until these studies, IT has not been measured in long-term care settings. We found many different types of technology being used in nursing homes," said Greg Alexander, professor in the MU Sinclair School of Nursing. "While some homes have advanced systems that aid nurses in making treatment decisions, wireless technology to assist in the delivery of care, and systems that support administrative and financial matters and inpatient self-management, the majority of Missouri nursing homes have minimal levels of technology in place."

According to Alexander, most agencies that advocate for wider uses of technology have overlooked nursing homes, despite the growing recognition that a stronger IT infrastructure is needed to address the complex health care needs of nursing home residents and improve the quality of care delivered in these facilities.

Recent concerns about errors in health care and patient safety have prompted policy makers and government committees to recommend the development of technologies to support clinical decision making and promote data standards. These recommendations also include designing systems that are able to communicate with each other. The Institute of Medicine recently released a report outlining the level of diversity and maturity of technology expected in nursing homes by 2010.

"These initial studies reveal that nursing home administrators have a long way to go before they achieve the goals suggested by the IOM report," Alexander said. "The development of IT profiles is a necessary first step toward benchmarking the best practices of IT use across nursing homes in the United States. The next step is to continue this study in other Midwest states and, eventually, in every state."

Alexander said the goal is to create a national infrastructure for health care providers that will enable the exchange of information between short-term care and long-term care facilities. Advancing technology will allow providers to coordinate and transfer work between settings as patients are relocated from one facility to another.

The first study, "IT Sophistication in Nursing Homes," will be published in "Long Term Care Interface." The second study, "Measuring IT Sophistication in Nursing Homes," will be published in the upcoming volume: Advances in Patient Safety from the Agency for Healthcare Research and Quality.

## "Green" method decontaminates deadly nerve agents

Research by two scientists has resulted in an exciting new method for rapidly and safely destroying toxic agents such as chemical weapons and pesticides.

Recently completed testing by an independent European defence corporation has shown the researchers' method to be greater than 99 per cent effective when used on the deadly nerve agents Tabun, Soman and VX.

When tested in solution, full destruction of all three agents was achieved in less than 30 seconds. Testing on contaminated surfaces showed virtually complete decontamination of the agents in 10 minutes – the shortest of the time periods tested.

The technology is good news for organizations such as homeland security and emergency first-responders, says Davis Hill, Commercial Development Manager for PARTEQ Innovations, the technology transfer office of Queen's. "Both the speed and the benign nature of the method mean that facilities or equipment exposed to the contaminants could be cleared and ready for use almost immediately."

The method was developed by Drs. Stan Brown and Alexei Neverov, specialists in catalytic chemistry, who for several years have tested their approach using model compounds in their lab.

"Our research results with model compounds demonstrated the method to be extremely effective, but the bigger question to us was, would it work on live agents?" Dr. Brown says. "These latest tests corroborate every result seen in our testing of this method over the past five years."

Phosphorus-based chemical weapons, pesticides and related compounds act as acetyl cholinesterase inhibitors, meaning they block nerve impulses, leading to paralysis, respiratory failure and eventually death.

The Queen's scientists invented mild, non-corrosive alcohol-based methodologies that are remarkably effective in destroying these types of organophosphorus agent in seconds.

The reaction products of the tested method are non-toxic, making it a "green" alternative to existing decontamination practices, which rely on caustic agents such as lye or bleach, and which can damage or destroy contaminated equipment or facilities.

With growing public demands to limit the use of toxic chemicals worldwide, the researchers' method offers a safe, green option for destroying chemical weapons stockpiles, as well as for rapid cleanup of environmental spills. A more immediate application is in counteracting possible terrorist attacks using chemical weapons agents, such as in the Tokyo subway attack of 1995, which killed 12 people and left more than 5,500 others ill.

The decontamination methodology has no special environmental requirements, meaning it can be easily stored and used at all temperatures and under most conditions.

"This seemingly simple chemical method offers an elegant, rapid and clean solution to a difficult problem," says Dr. Dupont Durst, Head of the Chemical Methodology Team at the U.S. Army Edgewood Chemical Biological Center.

*The testing was funded in part by the PARTEQ Proof of Principle Fund, financed by the Ontario Research Commercialization Program.*

## Award-winning study says back pain may be in your genes

***Study into causes of disc degeneration awarded Kappa Delta Award from American Academy of Orthopaedic Surgeons***

What do you learn by looking at the spines of hundreds of Finnish twins? If you are the international team of researchers behind the Twin Spine Study, you find compelling proof that back pain problems may be more a matter of genetics than physical strain.

The findings of the Twin Spine Study, an ongoing research program started in 1991, have led to a dramatic paradigm shift in the way disc degeneration is understood. Last month a paper presenting an overview of the

Twin Spine Study's multidisciplinary investigation into the root causes of disc degeneration received a Kappa Delta Award from the American Academy of Orthopaedic Surgeons, arguably the most prestigious annual award in musculoskeletal research.

"In the past, the factors most commonly suspected of accelerating degenerative changes in the discs were various occupational physical loading conditions, such as handling of heavy materials, postural loading and vehicular vibration," said lead researcher Michele Crites-Battié of the University of Alberta's Faculty of Rehabilitation Medicine.

Drawing on information from 600 participants in the population-based Finnish Twin Cohort—147 pairs of identical and 153 pairs of fraternal male twins—the Twin Spine Study has turned the dominant "injury model" approach to disc degeneration on its head. Researchers from Canada, Finland, the United States and the United Kingdom compared identical twin siblings who differed greatly in their exposure to a suspected risk factor for back problems; for example, one of the twins had a sedentary job while the other had heavy occupational physical demands, or one routinely engaged in occupational driving while the other did not. The studies yielded startling results, suggesting that genetics play a much larger role in disc degeneration than previously thought.

Despite extraordinary differences between identical twin siblings in occupational and leisure-time physical loading conditions throughout adulthood, surprisingly little effect on disc degeneration was observed. The findings indicated that while physical loading—handling heavy loads, bending, twisting and static work in awkward postures—appears to influence disc degeneration, the effects are very modest. During the course of the exposure-discordant twin studies, said Crites-Battié, the observation that struck anyone who viewed the twin sibling images side-by-side was the strong resemblance in disc degeneration, not only in the degree of degeneration, but also in the types of findings and spinal levels involved.

The Twin Spine Study is far from over: having found evidence that genetics may play an overlooked role in disc degeneration, the team of North American and European is now working to identify the specific genes and biological mechanisms influencing disc degeneration and back pain problems; understanding how degeneration progresses over time; and differentiating normal, inconsequential changes from degenerative changes that lead to pain.

"This advance in the understanding of disc degeneration provides a foundation from which to develop new hypotheses and more fruitful research that may help shed light on one of the most common and costly musculoskeletal conditions facing the developed countries of the world," said Crites-Battié.

## 14-year-old CEO makes chemistry a game with 'Elementeo'

Age seems to be no obstacle when it comes to starting a business. That's the case with 14-year-old Anshul Samar, CEO of Alchemist Empire, Inc., who invented a trading card game, "Elementeo," that aims to teach chemistry to students in a fun, unusual way.

At the 235th National Meeting of the American Chemical Society in New Orleans, Samar will present his inventive card game. While other 14-year olds play on their Xbox, this precocious CEO hopes to secure $500,000 in funding so his Silicon Valley-based startup can begin mass producing the game.

"I have always wanted to show the world that the youth can start a business and have fun at the same time," says Samar.

Like other popular trading card games, Elementeo casts two players against each other in card-based fantasy combat. But unlike "Pokemon" or "Magic: the Gathering," Samar says that Elementeo educates just as much as it entertains.

The game is based on a 121-card deck of chemical elements, compounds and catalysts. Every card has an explanation of the element or compound's uses and chemical properties. For example, the Oxygen card can rust neighboring metal cards and the Copper Conductor card can shock any metals. The oxidation state of an element is used as its attack power, and its physical state determines its movement on the board. The goal of the game is to reduce the opponent's electrons to zero through strategic use of each card's chemical properties.


***Part whimsical, part educational: One of the 121 cards that make up the Elementeo deck.***

"Our aim is to combine fun, excitement, education, and chemistry, all in one grand concoction," says Samar. "We don't want to create a fantasy wizard world or create a boring education textbook world, but combine the two where fun and learning come together without clashing!"

Samar received $500 in seed money from the California Association of the Gifted (CAG) to develop a prototype of Elementeo. Now, after stealing the show at the entrepreneur conference TiECON in mid-2007, Samar hopes to get the financial backing he needs to mass produce Elementeo.

"You are not a geek or a nerd if you like chemistry," says Samar. "If people do end up calling you a geek because you love chemistry, don't worry, those people are going to end up working for you at the end!"

## Newly discovered 'superinsulators' promise to transform materials research, electronics design

ARGONNE, Ill. (April 4, 2008) – Superinsulation may sound like a marketing gimmick for a drafty attic or winter coat. But it is actually a newly discovered fundamental state of matter created by scientists at the U.S. Department of Energy's Argonne National Laboratory in collaboration with several European institutions. This discovery opens new directions of inquiry in condensed matter physics and breaks ground for a new generation of microelectronics.

Funding for this experiment came principally from the Novosibirsk Institute of Semiconductor Physics and the University of Regensberg. The Basic Energy Sciences Division of the Department of Energy's Office of Science and Argonne Materials Theory Institute also contributed in part to the research.

Led by Argonne senior scientist Valerii Vinokur and Russian scientist Tatyana Baturina, an international team of scientists from Argonne, Germany, Russia and Belgium fashioned a thin film of titanium nitride, which they then chilled to near absolute zero. When they tried to pass a current through the material, the researchers noticed that its resistance suddenly increased by a factor of 100,000 once the temperature dropped below a certain threshold. The same sudden change also occurred when the researchers decreased the external magnetic field.

Like superconductors, which have applications in many different areas of physics, from accelerators to magnetic-levitation (maglev) trains to MRI machines, superinsulators could eventually find their way into a number of products, including circuits, sensors and battery shields.

If, for example, a battery is left exposed to the air, the charge will eventually drain from it in a matter of days or weeks because the air is not a perfect insulator, according to Vinokur. "If you pass a current through a superconductor, then it will carry the current forever; conversely, if you have a superinsulator, then it will hold a charge forever," he said.

"Titanium nitride films, as well as films prepared from some other materials, can be either superconductors or insulators depending on the thickness of the film," Vinokur said. "If you take the film which is just on the insulating side of the transition and decrease the temperature or magnetic field, then the film all of a sudden becomes a superinsulator."

Scientists could eventually form superinsulators that would encapsulate superconducting wires, creating an optimally efficient electrical pathway with almost no energy lost as heat. A miniature version of these superinsulated superconducting wires could find their way into more efficient electrical circuits.

Titanium nitride's sudden transition to a superinsulator occurs because the electrons in the material join together in twosomes called Cooper pairs. When these Cooper pairs of electrons join together in long chains, they enable the unrestricted motion of electrons and the easy flow of current, creating a superconductor. In superinsulators, however, the Cooper pairs stay separate from each other, forming self-locking roadblocks.

"In superinsulators, Cooper pairs avoid each other, creating enormous electric forces that oppose penetration of the current into the material," Vinokur said. "It's exactly the opposite of the superconductor," he added.

The theory behind the experiment stemmed from Argonne's Materials Theory Institute, which Vinokur organized six years ago in the laboratory's Materials Science Division. The MTI hosts a handful of visiting scholars from around the world to perform cutting-edge research on the most pressing questions in condensed matter physics. Upon completion of their tenure at Argonne, these scientists return to their home institutions but continue to collaborate on the joint projects. The MTI attracts the world's best condensed matter scientists, including Russian "experimental star" Tatyana Baturina, who, according to Vinokur, "became a driving force in our work on superinsulators."

Scientists from the Institute of Semiconductor Physics in Novosibirsk, Russia, Regensburg and Bochum universities in Germany and Interuniversity Microelectronics Centre in Leuven, Belgium, also participated in the research. The research appears in the April 3 issue of Nature.

## Evidence now suggests eating soy foods in puberty protects against breast cancer

### *But to be useful, the way soy works needs to be better understood, says researcher*

Washington, D.C. – Evidence is growing from animal and human studies that genistein, a potent chemical found in soy, protects against development of breast cancer - but only if consumed during puberty, says a Georgetown University Medical Center researcher in the British Journal of Cancer published online today. The challenge now, she says, is for scientists to understand precisely why soy appears to provide a shield against the most common cancer in women.

"Timing seems to be vitally important in use of this bioactive food, and if we can figure out why that is so, then we may be able to help prevent breast cancer in the widest sense possible," says the researcher, Leena Hilakivi-Clarke, Ph.D., a professor of oncology at the Lombardi Comprehensive Cancer Center at Georgetown.

Although there are a number of tantalizing theories to explain the connection, "at the present time no convincing explanation can be offered as to why the breast cancer-risk reducing effect of genistein might be strongest during childhood and early adolescence," she says.

Hilakivi-Clarke is a senior author of a review article published in the journal that sums up the state of knowledge concerning the role of early life genistein exposures in modifying breast cancer risk. She has long studied the link between soy use and breast cancer, as have her three co-authors, all Finnish researchers.

There have only been three human studies that tracked soy use during puberty and later breast cancer development, and two of them focused on Asian females, who eat soy in their traditional diet. But these studies suggest soy offers a very strong protective effect – a 50 percent or more reduction in the risk of breast cancer - when soy is eaten during childhood and adolescence.

The strongest evidence for genistein's protective effect comes from studies in mice and rats, Hilakivi-Clarke says. For example, numerous studies in rats show that the data regarding prepubertal exposure to genistein are very consistent in showing a reduction in mammary cancer risk, she says. Exposure to soy in fetal development or in adult life does not have the same protective effect.

Further examination of experimental versus control rats demonstrated that use of genistein in puberty cut the number of so-called "terminal end buds" in the breast. These are the structures that lead to growth of the mammary epithelium, which are the cells lining milk ducts, etc., and it is in these epithelial cells that breast cancer originates. But Hilakivi-Clarke says it is not clear if a mere reduction in the number of these structures could reduce cancer risk, or why.

Other studies suggest that genistein controls expression of genes in terminal end buds that regulate cell growth, repair and death. For example, the chemical could be controlling the ability of stem cells, found on these buds, to reproduce themselves or to differentiate into more specialized cells. "There is evidence that suggests that the more stem cells there are on these structures, the greater the risk of breast cancer development," she says. This evidence supports the theory that breast cancer arises from stem cells that have lost growth control.

Other associated research has found that the genes that genistein appears to activate in developing mammary glands are well known --- BRCA1, p53, and PTEN tumor suppressors, Hilakivi-Clarke says. These genes repair genetic damage and control cell survival and death, and they may also help control stem cell reproduction, she says, and genistein apparently "up-regulates" these genes, boosting production of their beneficial proteins.

What is perhaps most intriguing, she says, is that the same process that protects the breast from excess growth during pregnancy seems to be at work during puberty. "In pregnancy, BRCA1 is also up-regulated, perhaps in order to control the fate of stem cells, allowing them to make more cells for milk production, for example, but not more of themselves."

So Hilakivi-Clarke favors the notion that genistein is acting as a breast cancer protective just as an early first pregnancy in women is known to protect against later development of the cancer:

"If malignancies occur in breast stem cells, then it is better that many of these cells are differentiated earlier rather than later. Pregnancy hormones do that, so the shorter time there is between puberty and pregnancy, the greater that protection may be," she says. "Genistein may also help control the fate of stem cells in the same way."

"We think this is the mechanism by which genistein works, but we really don't know and we need to find out," Hilakivi-Clarke says. "The findings will matter."

## Ancient Imbalances Sent Earth's Continents "Wandering"

**Anne Minard** for National Geographic News April 7, 2008

A new study lends weight to the controversial theory that Earth became massively imbalanced in the distant past, sending its tectonic plates on a mad dash to even things out.

Bernhard Steinberger and Trond Torsvik, of the Geological Survey of Norway, analyzed rock samples dating back 320 million years to hunt for clues in Earth's magnetic field about the history of plate motions.

The researchers found evidence of a steady northward continental motion and, during certain time intervals, clockwise and counterclockwise rotations.

That pattern matches the predictions of a phenomenon known as true polar wander, a theory first proposed in the 1950s.

The theory states that at times Earth's surface mass becomes imbalanced. The continents become dramatically offset from the planet's spin axis and so move rapidly to right themselves.

The new study shows evidence for such motion within the past 320 million years that would have been enough to shift the continents by about 18 degrees latitude.

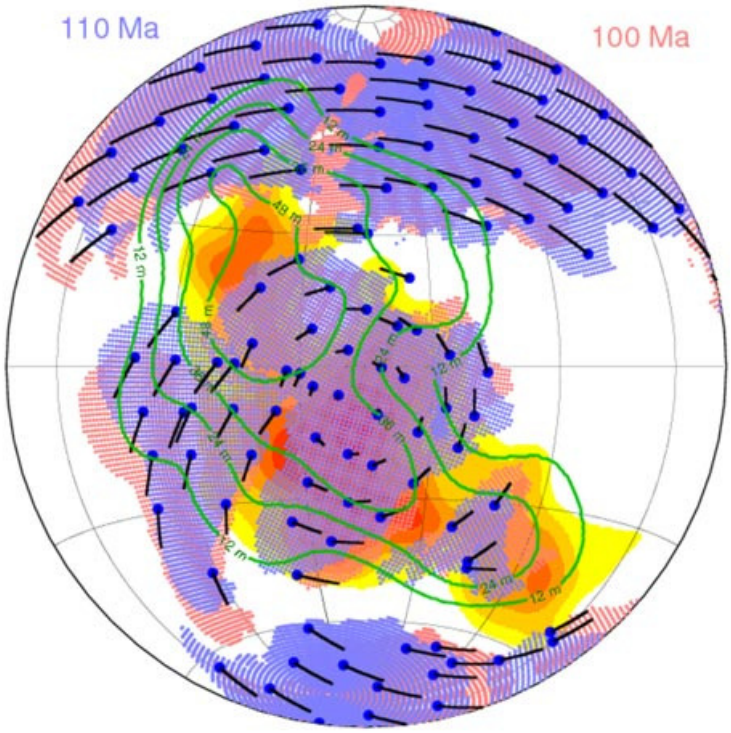
A change like that today would put Richmond, Virginia, where Mexico City is now. (See a map of the region.)

**Island Hot Spots**

"I am surprised that our results clearly indicate those episodes of true polar wander at all," Steinberger said.

"Up until now, there wasn't really any agreement in the community about the existence and amount of true polar wander."

That's because the phenomenon has been difficult to distinguish from the slower motion of tectonic plates traveling over the underlying mantle, Steinberger said.




***An illustration shows what Earth's continents looked like 110 million to 100 million years ago and their rotation based on magnetic signatures in ancient rocks. A new study suggests that the motion represents a phenomenon called true polar wander, in which Earth's landmasses become imbalanced compared to its spin axis and then move rapidly to right themselves.*** **Image courtesy Bernhard Steinberger**

Scientists often use hot spots, relatively fixed thermal plumes of material that rise up from the deep mantle, to track the paths of plates. The Hawaiian island chain is thought to be an example of a hot spot.

But geological records of suitable hot spot chains only go back about 130 million years.

A convergence of improvements to geologists' tools paved the way for the team to probe further back in time, Steinberger said.

"We use an updated global plate-tectonic reconstruction and integrate suitable paleomagnetic results from all continents," he said.

The authors were then able to compute the global average of continental motion and rotation as far back as 320 million years ago.

Paleomagnetic records like the ones used in the study can provide a new reference frame for relating surface motions to deep-mantle processes, the authors say.

The study appeared in last week's issue of the journal Nature, and another paper elaborating on the results is in press with Reviews of Geophysics.

**Same on Mars?**

Given current understanding of Earth's geology, Steinberger is puzzled that true polar wander doesn't show up more often in the planet's history.

"It points toward a long-term stability … which is not expected from fluid dynamics, something which currently geodynamicists try to understand."

Papers published in the journal Science in 1997 and 1998 proposed a much more dramatic polar wander associated with the Cambrian Explosion, a huge diversification in species that shows up in the fossil record beginning around 550 million years ago.

Co-authors of those studies suggested that Earth's continents were thrown asunder relative to the planet's spin axis by about 90 degrees at the time.

One of the researchers, Joseph Kirschvink of the California Institute of Technology, theorized that the shift happened after one or more major subduction zones in the ancient oceans closed down during the final assembly stages of the supercontinent Gondwanaland.

That sent the entire continent rotating at almost a right angle beginning about 534 million years ago, said the authors of the earlier work.

About 16 million years later, North America darted from deep in the Southern Hemisphere to the Equator.

"Even the type of marine rocks deposited on the various continents—carbonates in the tropics, and clays and clastics in high latitudes—agree with these paleomagnetically determined motions," Kirschvink notes on his Web site.

Kirschvink's co-author David Evans, now an associate professor of geology at Yale University, said he's most excited about a relationship between the latest paper and one that came out in Nature last year.

The 2007 study proposes similar continental shake-ups on Mars.

"In the geosciences, we as a community have continued to be impressed by the differences among all the terrestrial planets," he said.

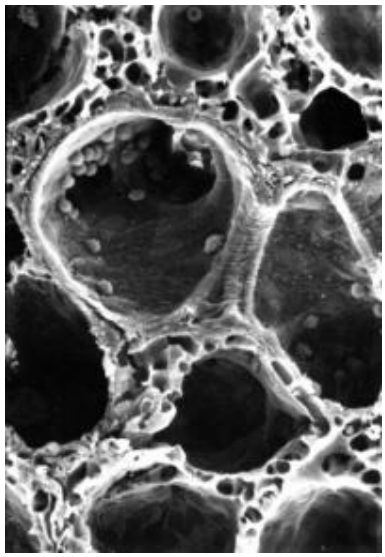
But when it comes to polar wander, Earth and Mars might not be so far apart.

Evans said large igneous regions on both planets—Tharsis on Mars and the central Atlantic magmatic province on Earth—were so massive that they threw their host planets off balance in the distant past.

*Preparation of the review was supported by grants from the National Cancer Institute (NCI), the National Institute of Environmental Health Sciences (NIEHS), and the Academy of Finland. Co-authors include Anni Warri, Ph.D., Niina Saarinen, Ph.D., and Sari Makela, M.D., Ph.D., from the University of Turku in Finland.*

## Biochemical signals associated with atherosclerosis may damage other organs

NEW ORLEANS, April 9, 2008—Many scientists view atherosclerosis, or hardening of the arteries, as a localized disease characterized by the build up of fatty plaques in the arteries, which can eventually cause heart attacks and strokes. Now, in a finding that challenges conventional knowledge, researchers in New York and North Carolina report that plaques formed in arteries are associated with certain harmful chemical reactions that can contribute to damage in the lungs, liver, and other organs.



***Biochemical signals associated with atherosclerosis may damage other organs, researchers say. Shown is a blood vessel viewed under a high-powered microscope.***

The findings suggest that the effects of atherosclerosis are more widespread than previously believed, the researchers say. The study could lead to new targets for developing drugs that could help prevent or reduce these chemical changes that appear to accompany heart disease, the number one cause of death in the U.S. Their study was presented today at the 235th national meeting of the American Chemical Society.

"Our findings add new knowledge to the big melting pot of this complex disease called atherosclerosis," says study leader Rita Upmacis, Ph.D., a chemist at Weill Medical College of Cornell University in New York. "I anticipate that future research will establish whether the harmful protein modifications we observed in animal organs can be prevented and provide the basis of new treatments for the disease."

Scientists are closing in on the root causes of the disease. One of the more promising lines of research focuses on the interaction between certain highly reactive nitrogen molecules and proteins. Under certain conditions, this interaction produces nitrotyrosine, which has been linked to Alzheimer's, arthritis, cancer, and other disorders. However, scientists know little about the role of nitrotyrosine in atherosclerosis.

In the new study, Upmacis and colleagues worked with laboratory mice that have atherosclerosis. These mice are widely used in atherosclerosis research that cannot be done in humans. Mice that are genetically prone to atherosclerosis and fed a high-fat diet developed high levels of nitrotyrosine in their heart, lung, liver, and kidney. By contrast, mice that were fed regular diets showed no such increase. The rise in nitrotyrosine levels suggests that high-fat diets in animals with atherosclerosis can help trigger nitrotyrosine accumulation in the proteins of various organs, the scientists say.

Upmacis and colleagues also conducted a related experiment in atherosclerotic mice lacking the gene that makes nitric oxide synthase (iNOS), an enzyme that orchestrates accumulation of nitrotyrosine in proteins. In association with prior findings that iNOS gene deletion limits the formation of atherosclerotic plaques, the new study showed that nitrotyrosine accumulation in proteins is reduced in diverse organs when iNOS is absent.

"The findings support an emerging view that iNOS could be a new target for treating atherosclerosis and that limiting nitrotyrosine accumulation in the lungs, liver, and other organs could help fight the damaging effects of the disease," Upmacis says. "But the trick will be to develop a drug to block this pathway without causing any unwanted side effects."

Potentially, the accumulation of nitrotyrosine in the blood can be utilized as a diagnostic test to track atherosclerosis and provide a clearer picture of damage to organs, the researchers say.

## People with diabetes may have all natural citrus supplement

### *KGK Synergize Inc. presents Diabetinol, test results*

SAN DIEGO, CA., April 9 - Two new studies presented at the Experimental Biology Annual Meeting suggest that an all-natural dietary supplement made from citrus may help people with type 2 diabetes lower their blood glucose numbers after a meal and their LDL-cholesterol levels.

Mal Evans, DVM, M.Sc, PhD, KGK Synergize Inc's Scientific Director, said, "Our scientifically validated testing has consistently shown that Diabetinol™ improves blood glucose numbers. This time we saw a sizeable

change in glucose intolerance in just a short time. This is good news for many of the 21 million Americans with diabetes. Tighter blood sugar control may mean less diabetic complications like nerve pain and kidney disease. And, that could mean less disability and expense from complications and associated medications and certainly less stress for the patient.

"Although there were no statistically significant changes in fasting blood glucose levels in either group, the Diabetinol™-treated subjects demonstrated an excellent favorable downward trend in their hemoglobin A1C levels. These results suggest that when administered to people with type 2 diabetes over a longer treatment period, Diabetinol™ significantly improves glucose tolerance or the blood glucose numbers following a meal.

"Additionally, the Diabetinol™-treated group showed improvements in LDL-cholesterol levels. An elevated LDL-cholesterol level is a risk factor for heart disease, and having type 2 diabetes increases an individual's risk for developing heart disease two to four times. In fact, sixty-five percent of deaths from diabetes are related to cardiovascular causes such as heart attack and stroke," said Evans.

Hemoglobin A1C is an indicator of average blood glucose control over two to three months and is correlated to an individual's risk of developing diabetic complications such as diseases of the eye, kidney and nerves.

In a pilot study, twenty adults with diabetes who were taking oral diabetes medications were randomly assigned to receive either Diabetinol™ or a placebo twice per day for three months. Each subject had mildly to moderately elevated cholesterol levels at the start of the study as well.

After 84 days, the group receiving Diabetinol™ showed a significant 19 percent reduction in glucose intolerance measured as peak changes in blood glucose over the four hours of a standard oral glucose challenge. The placebo group showed no significant improvements in glucose intolerance. A standard glucose challenge involves ingesting 100 grams of glucose and having blood glucose measurements after 30 minutes and hourly for four hours. Neither the investigators nor the volunteers knew who was receiving the Diabetinol™ or the placebo.

The number of Americans with diabetes has been increasing as obesity rates continue to rise. At least 90% of Americans with diabetes have type 2 diabetes. In type 2 diabetes, the body either produces too little insulin or the cells do not respond properly to the insulin and leave the cells starved for energy while raising the blood glucose level.

Earlier animal studies led researchers to test Diabetinol in humans. Twelve hamsters were treated with a special high-fructose diet to induce diabetes-like symptoms including increased blood glucose, insulin, cholesterol and triglyceride levels. Half of the animals were then given Diabetinol™ for 42 days. The other six hamsters were given no anti-diabetic treatment. At the end of the study, the Diabetinol™-treated animals showed improvements in each blood glucose, insulin, and cholesterol and triglyceride levels.

Taken together, these studies suggest that Diabetinol™ may help lower blood glucose levels and be beneficial in lowering the risks of heart disease and diabetic complications in people with type 2 diabetes.

An additional six-month study is underway to evaluate Diabetinol™ treatment in a larger sample of people with type 2 diabetes.

**About KGK Synergize Inc:**

KGK Synergize provides contract research services to the health nutrition, biotechnology and pharmaceutical industries, which include analytical chemistry, in vitro assays, in vivo models, toxicology and human clinical trials.

In addition to its contract research capabilities, KGK has a Product Development Division which brings new and innovative natural health products to the point where they are ready to be manufactured and marketed. These products include SytrinolTM for cardiovascular health, DiabetinolTM for the treatment and/or prevention of Type II Diabetes, and DermytolTM, a new product for the protection of sun damage to the skin.

## 1 in 7 cases of bird flu could be prevented by closing schools in event of pandemic

Closing schools in the event of a flu pandemic could slow the spread of the virus and prevent up to one in seven cases, according to a new study published today in the journal Nature.

School closure is the non-pharmaceutical policy option that health organisations and governments most often consider to control the spread of a future flu pandemic, but there had previously been little evidence about its potential effectiveness.

Researchers from the MRC Centre for Outbreak Analysis and Modelling at Imperial College London, working with colleagues in France, used computer modelling to explore how school closure would affect the spread of a theoretical pandemic H5N1 avian flu virus which had mutated to pass between humans. They extrapolated from data collected by French GPs, showing how school holidays alter the patterns of influenza transmission in France.

The new study shows that shutting down schools for a prolonged period in the event of a pandemic could prevent up to one in seven cases.

School closures would also slow and flatten the pandemic, reducing the numbers becoming ill in the worst week of the outbreak by up to 40%. The researchers suggest that this could be important in reducing

pressures on healthcare services during this time so that hospitals and GP surgeries would be better able to cope.

However, the researchers caution that closing schools for a prolonged period would be a very costly measure, particularly because of its impact on working parents. Taking away the childcare that schools provide could also affect the spread of the virus, in ways that are difficult to model using existing information.

For example, parents might share childcare with each other or place their children with child minders, so that children would still mix and spread the virus between them, much as they would in a school setting. In addition, the number of healthcare professionals available to care for those with the virus might fall if some needed to stay home to look after their children.

Dr Simon Cauchemez, one of the authors of the study from the MRC Centre for Outbreak Analysis and Modelling at Imperial College London, said: "Our research shows that school closures could be a useful measure in terms of slowing the spread of a flu pandemic. However, its effectiveness would very much depend on what other measures, like vaccination or antiviral drugs, were put in place as well."

Professor Neil Ferguson, another author of the study from the MRC Centre for Outbreak Analysis and Modelling at Imperial College London, added: "Closing schools for a long time is not an option you can take lightly, because it has a big economic and social impact, and the extent to which there would be a knock-on effect on transmission is hard to predict.

"Even though the children would not be in school, they would still mix with other children and adults in the community and spread the virus through this contact. We also think it's likely that parents would need to devise new childcare arrangements so that they could continue working, meaning that they would be setting up the equivalent of small schools where the virus could easily be transmitted," added Professor Ferguson.

The researchers reached their conclusions after analysing surveillance data collected since 1984 by 1,200 GPs in France, to see how the rate of influenza transmission is reduced during the country's school holidays. This data showed that holidays lead to a 20-29% reduction in the rate at which influenza is transmitted to children, but that they have no detectable effect on the contact patterns of adults. The French data also revealed that children were responsible for around 46% of all infections.

The researchers then extrapolated from this to explore how prolonged school closure might affect transmission in the event of a pandemic of mutated H5N1 in a country like France.

At present, the H5N1 strain of influenza is transmitted to people by birds and person-to-person transmission is very rare. However, the virus is so lethal that if it were to mutate and become more transmissible, as in the researchers' new model, the consequences of a global pandemic could be disastrous.

## Omega-3 intake during last months of pregnancy boosts an infant's cognitive and motor development

Quebec City, April 9, 2008—A study supervised by Université Laval researchers Gina Muckle and Éric Dewailly reveals that omega-3 intake during the last months of pregnancy boosts an infant's sensory, cognitive, and motor development. The details of this finding are published in a recent edition of the Journal of Pediatrics.

To come to this conclusion, researchers first measured docosahexaenoic acid (DHA) concentration—a type of omega-3 fatty acid involved in the development of neurons and retinas—in the umbilical cord blood of 109 infants. "DHA concentration in the umbilical cord is a good indicator of intra-uterine exposure to omega-3s during the last trimester of pregnancy, a crucial period for the development of retinal photoreceptors and neurons," explains Dr. Dewailly.

Tests conducted on these infants at 6 and 11 months revealed that their visual acuity as well as their cognitive and motor development were closely linked to DHA concentration in the umbilical cord blood at the time of their birth. However, there was very little relation between test results and DHA concentration in a mother's milk among infants who were breast-fed. "These results highlight the crucial importance of prenatal exposure to omega-3s in a child's development," points out Dr. Muckle.

Researchers observed that DHA concentration in the umbilical cord blood was in direct relation with the concentration found in a mother's blood, a reminder of the importance of a mother's diet in providing omega-3 fatty acids for the fetus. They also noted that DHA concentration was higher in the fetus's blood than in the mother's. "While developing its nervous system, a fetus needs great quantities of DHA. It can even transform other types of omega-3s into DHA in order to develop its brain," explains Dr. Dewailly.

For the members of the research team, there is no doubt that all pregnant women should be encouraged to get sufficient amounts of omega-3s. "A diet rich in omega-3s during pregnancy can't be expected to solve everything, but our results show that such a diet has positive effects on a child's sensory, cognitive, and motor development. Benefits from eating fish with low contaminant levels and high omega-3 contents, such as trout, salmon, and sardines, far outweigh potential risks even during pregnancy," conclude the researchers.

*In addition to Muckle and Dewailly, who are also affiliated to the Centre de recherche du CHUQ, Quebec City, the study was co-authored by Pierre Ayotte from Université Laval, as well as Joseph Jacobson, Sandra Jacobson, and*

*Melissa Kaplan-Estrin from Wayne State University. This study was funded by the National Institute of Environmental Health Sciences, Indian and Northern Affairs Canada, Hydro-Québec, and Health Canada.*

## Study: Health "Shocks" Diminish Wealth More Later In Life

COLUMBUS, Ohio -- A new study underscores the need for seniors to maintain their health -- in order to maintain their wealth.

Building on a 2003 study that found that healthy seniors are more likely to retain their savings, Ohio State University researchers have now discovered that the later in life a serious illness occurs, the more damage it does to a person's finances.

The study found that when seniors develop a new and serious health problem -- experiencing what the researchers call a "health shock" -- early in retirement, they lose a substantial portion of their savings immediately. But if they experience the health shock later in life, they will lose even more.

Study participants over 70 years of age lost 40 percent more of their savings than similar seniors who were just four years younger.

The results appear in a recent issue of the Journal of Population Economics.

The impact of health problems on seniors' finances has been studied over the years, but scientists have drawn different conclusions -- in part because they measured health and wealth in different ways, said Jinkook Lee, professor of consumer sciences at Ohio State.

This study is the first to gather a long-term perspective on how chronic illness diminishes seniors' wealth over time.

"When someone has a chronic health problem, they tend to find a way to manage in their daily life, but financially, the negative effect doesn't go away," Lee said. "If you develop diabetes, for instance, it costs you for your entire life."

She and coauthor Hyungsoo Kim of the University of Kentucky, Lexington, have been tracking the health and wealth of seniors using a broad based, national survey: the National Institute on Aging's Asset and Health Dynamics of the Oldest Old (AHEAD) survey.

The later in life that health shocks occurred, the more they diminished a person's wealth, the researchers found. In 1998, participants who had recently experienced a health shock lost an average of 5.5 percent of their overall wealth as a result. But when they were two years older, the average loss for a health shock was 8.7 percent of wealth.

In a 2003 study of AHEAD data, they found that seniors who maintain their health are 6 to 7 percent more likely to retain a significant portion of their savings, compared to those who suffer from health problems. This new study compared the long term financial repercussions of pre-existing chronic health problems with those caused by the sudden onset of a new health problem late in life. Lee and Kim focused on five common and serious health conditions: diabetes, cancer, lung disease, heart condition, and stroke.

They examined how the wealth of more than 5,500 AHEAD participants changed between 1995 and 2002. All were aged 70 or older at the start of the study.

When participants developed a new and serious health condition, the researchers categorized those incidents as a "health shock."

The later in life that health shocks occurred, the more they diminished a person's wealth, the researchers found. In 1998, participants who had recently experienced a health shock lost an average of 5.5 percent of their overall wealth as a result. But when they were two years older, the average loss for a health shock was 8.7 percent of wealth.

When they were four years older (in 2002), it was 9.5 percent -- 40 percent more than when the participants were first studied in 1998.

"If you have a chronic health condition, it diminishes your wealth throughout your life. And if you get a health shock, it diminishes your wealth even more," Lee said. "Though over time the costs associated with that shock may decrease, that illness will still deflate your wealth continuously thereafter."

To Lee, this research demonstrates how costly healthcare is to Americans, even if they have Medicare coverage.

Medicare typically pays a little over half of someone's medical bills, and seniors -- most of whom are living on a fixed income -- are forced to make up the difference by dipping into their savings. Add to that the fact that Americans are living longer, and the cost of healthcare keeps increasing.

Even if seniors can recover physically from a health shock, they can't recover financially.

"If we have some kind of health shock during our working years, maybe we are lucky and we have good health insurance from our job. Or maybe we can go out and get a second job or try to work longer hours to make up the cost. But seniors are past the age when they can do that," Lee said.

The lesson, she said, is that even average Americans need to give serious thought to the health care system, and plan for their retirement with healthcare costs in mind. People with chronic diseases in their family history can talk to their doctor to learn about the likelihood of developing these diseases themselves.

And then they can try to make better estimates of what their healthcare costs will be after they retire. They can also try to live healthier lives with the goal of staving off these diseases.

As part of her continuing research, Lee is traveling around the world to examine how different healthcare systems impact people's wealth. She is focusing on how universal healthcare systems, such as those in France and Canada -- and now, even in developing countries like Korea -- are easing the burden of citizens' healthcare costs.

## Powerful laser is 'brightest light in the universe'

* 18:04 09 April 2008
* NewScientist.com news service
*** David Shiga**

Physicists have turned on the world's most powerful laser, whose pulses are more intense than any known light source in the universe. The incredible temperatures and pressures it generates when it hits a target will let scientists explore conditions found in exploding stars and the cores of giant planets.

The Texas Petawatt Laser resides at the University of Texas in Austin, US. It can blast out infrared laser pulses that each have more than 1 petawatt of power. A petawatt is 1 million billion watts, far more than the output of all the world's power plants put together, which is measured in mere terawatts (1 terawatt is a trillion watts).

The Texas Petawatt Laser produced a pulse with more than 1 petawatt of power for the first time on 31 March. In the 1990s, the Petawatt laser at the Lawrence Livermore National Laboratory in California, US, part of a now-defunct laser facility called Nova, achieved pulses of more than 1 petawatt, but it is no longer in operation.

The operators of the Texas Petawatt Laser are slowly ramping up the laser's power. The device's director, Todd Ditmire of the University of Texas in Austin, says he expects to smash the Livermore laser's record within a few weeks and to eventually produce pulses of 1.4 petawatts.

**Short pulse**

The energy contained in each laser pulse is only about 200 joules, about as much as a light bulb consumes in a few seconds. But this modest amount of energy is packed into a very brief pulse just one-tenth of a trillionth of a second long, which makes it vastly more powerful than any light bulb.

The awesome power of the laser can be focused on a spot just one-tenth the width of a human hair, producing a light intensity higher than anything that has occurred in the universe since the big bang.

The most intense natural sources of light currently known in the cosmos are gamma-ray bursts, which occur when some massive stars collapse to form black holes or neutron stars, setting off powerful explosions as they do so.

**'Brightest light'**

"My astrophysicist friends tell me that near a gamma-ray burst, they surmised that the [light] intensity probably gets to 1020 watts per square centimetre during the explosion," Ditmire told New Scientist. Light from the Texas Petawatt laser can reach about 100 times that level, he says. "For the briefest instant, over a very small volume, we'll have the brightest light in the universe."

Scientists can produce extreme conditions by firing the laser at puffs of gas inside a vacuum chamber, experiments that will help them understand some of the most exotic environments in the universe.

When the laser hits the gas cloud, it unleashes a shock wave similar to those seen when stars die in supernova explosions. Supernova shock waves can nudge nearby gas clouds, triggering them to collapse and form stars.

Such experiments can also help scientists probe the interiors of gas giant planets like Jupiter as well as the innards of objects called brown dwarfs, which are gaseous orbs more massive than planets but not heavy enough to sustain the nuclear fusion that stars do.

**Antimatter plasma**

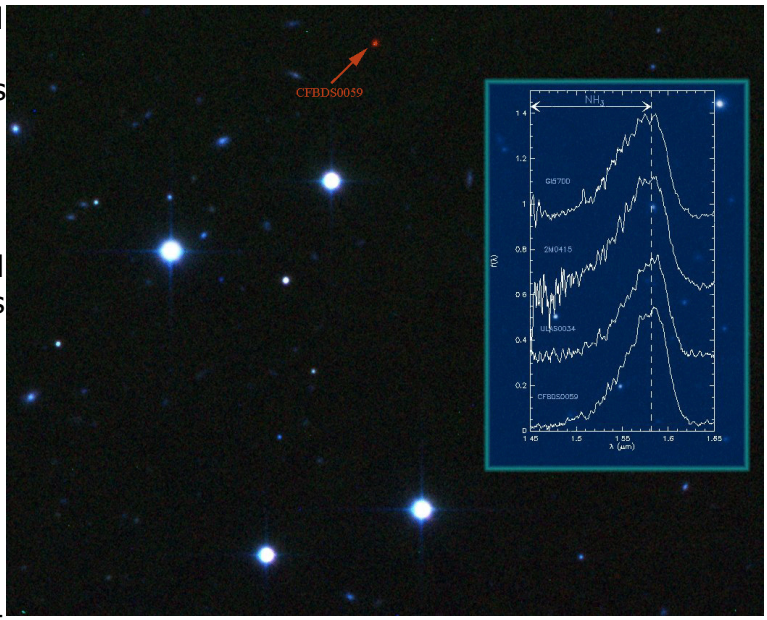
A laser pulse fired at a piece of material like aluminium briefly heats it to millions of degrees Celsius and raises its pressure to about 1 billion times that at sea level on Earth, similar to the extreme conditions inside gas giants and brown dwarfs.

The experiments could help scientists learn how easily this exotic matter conducts electricity, which could shed light on the magnetic fields produced by the objects.

The experiments could also help scientists better understand gamma-ray bursts. Some scientists say the extremely high temperatures present in gamma-ray bursts should lead to the production of antimatter, a phenomenon that might be replicated by the Texas Petawatt Laser.

"It's surmised that we can actually create a small amount of matter-antimatter plasma in the lab with the petawatt laser," Ditmire says.

# The coldest brown dwarf ever observed: Closing the gap between stars and planets




An international team of astronomers has discovered the coldest brown dwarf star ever observed. This finding, to be published in Astronomy & Astrophysics is a new step toward filling the gap between stars and planets.

An international team [1] led by French and Canadian astronomers has just discovered the coldest brown dwarf ever observed. Their results will soon be published in Astronomy & Astrophysics. This new finding was made possible by the performance of telescopes worldwide [2]: Canada France Hawaii Telescope (CFHT) and Gemini North Telescope, both located in Hawaii, and the ESO/NTT located in Chile.

The brown dwarf is named CFBDS J005910.83-011401.3 (it will be called CFBDS0059 in the following). Its temperature is about 350°C and its mass about 15-30 times the mass of Jupiter, the largest planet of our solar system [3]. Located about 40 light years from our solar system, it is an isolated object, meaning that it doesn't orbit another star.

***Fig. 1 - Picture of the brown dwarf CFBDS0059 (small red dot on the top of the picture) and its near-infrared spectrum (lowest curve) illustrating the presence of ammonia. This discovery also has important implications in the study of extrasolar planets. The atmosphere of brown dwarfs looks very much like that of giant planets, therefore the same models are used to reproduce their physical conditions. Such modeling needs to be tested against observations. Observing the atmospheres of extrasolar planets is indeed very hard because the light from the planets is embedded in the much stronger light from their parent stars. Because brown dwarfs are isolated bodies, they are much easier to observe. Thus, looking to brown dwarfs with a temperature close to that of the giant planets will help in testing the models of extrasolar planets' atmospheres.***

Brown dwarfs are intermediate bodies between stars and giant planets (like Jupiter). The mass of brown dwarfs is usually less than 70 Jupiter masses. Because of their low mass, their central temperature is not high enough to maintain thermonuclear fusion reactions over a long time. In contrast to a star like our Sun, which spends most of its lifetime burning hydrogen, hence keeping a constant internal temperature, a brown dwarf spends its lifetime getting colder and colder after its formation.

The first brown dwarfs were detected in 1995. Since then, this type of stellar object has been found to share common properties with giant planets, even though differences remain. For example, clouds of dust and aerosols, as well as large amounts of methane, were detected in their atmosphere (for the coldest ones), just as in the atmosphere of Jupiter and Saturn. However, there were still two major differences. In the brown dwarf atmospheres, water is always in gaseous state, while it condenses into water ice in giant planets; and ammonia has never been detected in the brown dwarf near-infrared spectra, while it is a major component of Jupiter's atmosphere. CFBDS0059, the newly-discovered brown dwarf, looks much more like a giant planet than the known classes of brown dwarfs, both because of its low temperature and because of the presence of ammonia.

To date, two classes of brown dwarfs have been known: the L dwarfs (temperature of 1200-2000°C), which have clouds of dust and aerosols in their high atmosphere; and the T dwarfs (temperature lower than 1200°C), which have a very different spectrum because of methane forming in their atmospheres. Because it contains ammonia and has a much lower temperature than do L and T dwarfs, CFBDS0059 might be the prototype of a new class of brown dwarfs to be called the Y dwarfs. This new class would then become the missing link in the sequence from the hottest stars to giant planets of less than -100°C, by filling the gap now left in the midrange.

[1] The team of astronomers includes P. Delorme, X. Delfosse (Observatoire de Grenoble, France), L. Albert (CFHT, Hawaii), E. Artigau (Gemini Observatory, Chile), T. Forveille (Obs. Grenoble/France, IfA/Hawaii), C. Reylé (Observatoire de Besançon, France), F. Allard, A. C. Robin (CRAL, Lyon, France), D. Homeier (Göttingen, Germany), C.J. Willott (University of Ottawa, Canada), M. C. Liu, T. J. Dupuy (IfA, Hawaii).

[2] CFBDS0059 was discovered in the framework of the Canada-France Brown-Dwarfs survey. The object was first identified in pictures from the wide-field camera Megacam installed on the CFHT (Canada France Hawaii Telescope). Infrared pictures were then obtained with the NTT telescope (La Silla, ESO, Chile) and confirmed the low temperature of the object. Finally, the spectrum showing the presence of ammonia was obtained using the Gemini North Telescope (Hawaii).

[3] The mass of Jupiter is about 300 times the Earth's mass and about 1/1000e of the Sun's mass.

# 'Doomed' Mars moon imaged in stunning detail

* 22:29 09 April 2008
* NewScientist.com news service
*** David Shiga**

Mars's little potato-shaped moon Phobos takes centre stage in stunning new false-colour and 3D images snapped by NASA's Mars Reconnaissance Orbiter. The moon, which some say would make an ideal destination for human space exploration, will one day be destroyed by the Red Planet.

In 2009, Russia is launching a robot meant to return a sample of the 22-kilometre-wide moon to Earth. Some scientists have also suggested that astronauts should head to the tiny moon, which might be a captured asteroid.

That's because its gravity is less than 1/1000th the strength of that on Earth, making it relatively easy to land on and leave again. Meteorite impacts may also have blasted samples of Martian rock up to its surface, where astronauts could easily retrieve them.

Any base set up there would have a finite lifetime, however, since Phobos is spiralling towards Mars at a rate of 1.8 metres per century. It faces a grim fate – it will eventually either smash into Mars or get ripped apart by the planet's gravity, although scientists estimate this will not occur for another 50 million years or so.

But for now, the moon is enjoying a close-up look by NASA's Mars Reconnaissance Orbiter (MRO), which carries the most powerful camera ever sent to another planet. On 23 March, the camera, called HiRISE (High Resolution Imaging Science Experiment), took some detailed new images of Phobos from 6800 and 5800 kilometres away.

***A 9-kilometre crater named Stickney dents the side of Mars's moon Phobos in this new false-colour image from the Mars Reconnaissance Orbiter, taken from a distance of 6800 kilometres*** **(Image: NASA/JPL-Caltech/U of Arizona)**

## Giant crater

Phobos appears in false colour in the new images, which were made by combining snapshots taken at three different wavelengths of visible and infrared light.

Phobos's surface is dominated by a large crater called Stickney. It stretches across 9 kilometres, or about 40% of Phobos's diameter. The impact that produced it is thought to have come close to shattering the moon to pieces.

Material around Stickney's rim is bluer – and therefore younger – than elsewhere on the moon's surface. "Based on analogy with material on our own Moon, the bluer colour could mean that the material is fresher, or hasn't been exposed to space as long as the rest of Phobos's surface has," says HiRISE team member Nathan Bridges of NASA's Jet Propulsion Laboratory in Pasadena, California, US.

Streaks visible on the walls of Stickney and other craters are thought to be places where material has tumbled down slopes in landslides.

## Strafed surface

And Phobos bears other scars of past violence. Much of its surface is riven by troughs and pockmarked by chains of craters. These may be places where the moon's surface was strafed by shrapnel thrown out by meteorite impacts on Mars.

In the closer of the HiRISE images, each pixel is about 5.8 metres across. Although other spacecraft such as NASA's Mars Global Surveyor, which is now lost, have passed closer to the moon and returned images with higher resolution, the HiRISE pictures are of better quality because the data they were made from contain less 'noise'.

Scientists have also combined HiRISE images taken from slightly different angles to produce a 3D view of the moon – something that has been previously done using images from the European Space Agency's Mars Express spacecraft. Full resolution images are available from NASA.

## Absence of clouds caused pre-human supergreenhouse periods

In a world without human-produced pollution, biological productivity controls cloud formation and may be the lever that caused supergreenhouse episodes during the Cretaceous and Eocene, according to Penn State paleoclimatologists.

"Our motivation was the inability of climate models to reproduce the climate of the supergreenhouse episodes of the Cretaceous and Eocene adequately," said Lee R. Kump, professor of geosciences. "People have tried increasing carbon dioxide in the models to explain the warming, but there are limits to the amounts that can be added because the existing proxies for carbon dioxide do not show such large amounts."

In general, the proxies indicate that the Cretaceous and Eocene atmosphere never exceeded four times the current carbon dioxide level, which is not enough for the models to create supergreenhouse conditions. Some researchers have tried increasing the amount of methane, another greenhouse gas, but there are no proxies for methane. Another approach is to assume that ocean currents changed, but while researchers can insert new current information into the models, they cannot get the models to create these ocean current scenarios.

Kump and David Pollard, senior research associate, Earth and Environmental Systems Institute, looked for another way to create a world where mean annual temperatures in the tropics were above 100 degrees Fahrenheit and polar temperatures were in the 50-degree Fahrenheit range. Changing the Earth's albedo -- the amount of sunlight reflected into space – by changing cloud cover will produce supergreenhouse events, the researchers report in today's (April 11) issue of Science.

According to the researchers, changes in the production of cloud condensation nuclei, the tiny particles around which water condenses to form rain drops and cloud droplets, decreased Earth's cloud cover and increase the sun's warming effect during supergreenhouse events.

Normal cloud cover reflects about 30 percent of the sun's energy back into space. Kump and Pollard were looking for a scenario that allowed in 6 to 10 percent more sunlight.

"In today's world, human generated aerosols, pollutants, serve as cloud condensation nuclei," says Kump. "Biologically generated gases are dominant in the prehuman world. The abundance of these gases is correlated with the productivity of the oceans."

Today, the air contains about 1,000 particles that can serve as cloud condensation nuclei (CCN) in a cubic centimeter (less than a tenth of a cubic inch). Pristine ocean areas lacking human produced aerosols are difficult to find, but in those areas algae produce dimethylsulfide that eventually becomes the CCNs of sulfuric acid or methane sulfonic acid.

Algae's productivity depends on the amounts of nutrients in the water and these nutrients come to the surface by upwelling driven by the winds. Warming would lead to ocean stratification and less upwelling.

"The Cretaceous was biologically unproductive due to less upwelling in the ocean and thermal stress on land and in the sea," says Kump. "That means fewer cloud condensation nuclei."

When there are large numbers of CCN, there are more cloud droplets and smaller droplets, consequently more cloud cover and brighter clouds. With fewer CCN, there are fewer droplets and they are larger. The limit to droplet size is 16 to 20 microns because the droplets then are heavy enough to fall out as rain.

"We began with the assumption that what would change was not the extent of clouds, but their brightness," says Kump. "The mechanism would lead to reduced reflection but not cloudiness."

What they found was that the clouds were less bright and that there were also fewer clouds. If they lowered the production of biogenic CCNs too much, their model created a world with remarkable warming inconsistent with life. However, they could alter the productivity in the model to recreate the temperature regime during supergreenhouse events.

"The model reduces cloud cover from about 64 percent to 55 percent which lets in a large amount of direct sunlight," Kump says. "The increased breaks in the clouds, fewer clouds and less reflective clouds produced the amount of warming we were looking for."

## Does the Internet really influence suicidal behavior?

***Feature: Suicide and the Internet***

People searching the Internet for information about suicide methods are most likely to come across sites that encourage suicide rather than sites offering help and support, finds a study in this week's issue of the BMJ.

Media reporting of suicide and its portrayal on television are known to influence suicidal behaviour, particularly the choice of method used, but little is known about the influence of the internet.

Recent reports in the popular press have highlighted the existence and possible influence of internet sites that promote suicide and web forums that may encourage suicide in young people.

But despite these recent controversies, the ease with which these sites may be found on the internet has not been systematically documented nor the kind of information they contain been described.

Researchers from the Universities of Bristol, Oxford and Manchester set out to replicate a typical search that might be undertaken by a person looking for instructions and information about methods of suicide using the four most popular search engines—Google, Yahoo, MSN, and Ask—and 12 simple search terms.

They analysed the first ten sites from each search, giving a total of 480 hits.

Altogether 240 different sites were found and just under half of these provided some information about methods of suicide. Almost a fifth of hits (90) were for dedicated suicide sites, of which half were judged to be encouraging, promoting, or facilitating suicide.

Sixty-two (13%) sites focused on suicide prevention or offered support and 59 (12%) sites actively discouraged suicide.

Almost all dedicated suicide and factual information sites provided information about methods of suicide. But, a fifth (21%) of support and prevention sites and over half (55%) of academic or policy sites, and all news reports of suicides also provided information about methods.

Overall, Google and Yahoo retrieved the highest number of dedicated suicide sites, whereas MSN had the highest number of prevention or support sites and academic or policy sites.

In addition, the three most frequently occurring sites were all pro-suicide, whereas the information site Wikipedia was fourth. All top four sites evaluated methods of suicide including detailed information about speed, certainty, and the likely amount of pain associated with each method.

However, there is currently no regulation of suicide sites in the UK because they are not illegal.

Self-regulation by internet providers and use of filtering software by parents to block sites are the main approaches to reducing potential harm from suicide sites. However, efforts to remove some of the most detailed technical descriptions of suicide methods may be easily circumvented, say the authors.

They conclude that service providers might pursue website optimisation strategies to maximise the likelihood that sites aimed at preventing suicide are preferentially sourced by people seeking information about suicide methods rather than potentially harmful sites.

## Wine may protect against dementia

There may be constituents in wine that protect against dementia. This is shown in research from the Sahlgrenska Academy at University of Gothenburg in Sweden.

The findings are based on 1,458 women who were included in the so-called Population Study of Women from 1968. When they were examined by physicians they were asked to report how often they drank wine, beer, and liquor by selecting from seven categories on a scale from 'never' to 'daily.' The researchers know nothing about how much they drank on each occasion, or how correct the estimates were. For each beverage the women reported having drunk more than once a month, they were classified as a consumer of that particular beverage.

Thirty-four years after the first study, 162 women had been diagnosed with dementia. The results show that among those women who reported that they drank wine a considerably lower proportion suffered from dementia, whereas this correlation was not found among those who had reported that they regularly drank beer or liquor.

"The group that had the lowest proportion of dementia were those who had reported that the only alcohol they drank was wine," says Professor Lauren Lissner, who directs the study in collaboration with Professor Ingmar Skoog, both with the Sahgrenska Academy.

The researchers nevertheless are reluctant to make any recommendations regarding whether a woman should begin to drink wine, continue to drink wine, or increase their consumption. It's also important to point out that these findings cannot be generalized for men, who have a different pattern of drinking.

"We have to be very cautious when we interpret these results, since we can't see in this type of population study what is cause and what is effect. There may be other factors in women who drink wine that provide them with protection against dementia, factors that we can't measure. But the correlation found is a strong one and can't be explained by other factors that we can measure, such as education, BMI, and smoking," says Lauren Lissner.

The researchers already knew that the drinking habits of Swedish women have changed over the last few decades. Today's women drink more wine and liquor, but less beer, than earlier generations did. The study shows, for example, that fewer than 20 percent of middle-aged women drank wine every week in the late 1960s. Today more than half of all women of that age report that they drink wine every week.

"These findings, in combination with the fact that women today drink more wine than 40 years ago, show that it is important to continue to do research on this correlation. In future analyses we will be studying the effect on more specific types of dementia, such as Alzheimer's disease. Other research methods will be needed in order to see what role wine and other alcoholic beverages play in the development of dementia," says Lauren Lissner.

**FACTS ABOUT THE POPULATION STUDY OF WOMEN**

This study is based on the population study of women in Göteborg, Sweden, called the Population Study of Women, started in 1968. 1,462 women aged 38, 46, 50, 54, and 60 were examined at that time by physicians and were interviewed about their lives. These women were subsequently examined in the same way again in 1974, 1980, 1992, 200, and 2005. For the same years, new women have been recruited for the study, which will make it possible both to monitor a certain generation through life and to compare different generations with each other.

Journal: American Journal of Epidemiology

Title of article: Alcohol Beverages and Incidence of Dementia: 34-Year Follow-up of the Prospective Population Study of Women in Göteborg

Authors: Kirsten Mehlig, Ingmar Skoog, Xinxin Guo, Madlen Schütze, Deborah Gustafson, Margda Waern, Svante Östling, Cecilia Björkelund, and Lauren Lissner  Read the article in its entirety at: http://aje.oxfordjournals.org/

## Grand Canyon may be as old as dinosaurs, says new study

***Study by University of Colorado at Boulder, California Institute of Technology pushes back assumed origins by 40-50 million years***

New geological evidence indicates the Grand Canyon may be so old that dinosaurs once lumbered along its rim, according to a study by researchers from the University of Colorado at Boulder and the California Institute of Technology.

The team used a technique known as radiometric dating to show the Grand Canyon may have formed more than 55 million years ago, pushing back its assumed origins by 40 million to 50 million years. The researchers gathered evidence from rocks in the canyon and on surrounding plateaus that were deposited near sea level several hundred million years ago before the region uplifted and eroded to form the canyon.

***The Grand Canyon may be as old as the dinosaurs, according to a new study by the University of Colorado and the California Institute of Technology***

A paper on the subject will be published in the May issue of the Geological Society of America Bulletin. CU-Boulder geological sciences Assistant Professor Rebecca Flowers, lead author and a former Caltech postdoctoral researcher, collaborated with Caltech geology Professor Brian Wernicke and Caltech geochemistry Professor Kenneth Farley on the study.

"As rocks moved to the surface in the Grand Canyon region, they cooled off," said Flowers. "The cooling history of the rocks allowed us to reconstruct the ancient topography, telling us the Grand Canyon has an older prehistory than many had thought."

The team believes an ancestral Grand Canyon developed in its eastern section about 55 million years ago, later linking with other segments that had evolved separately. "It's a complicated picture because different segments of the canyon appear to have evolved at different times and subsequently were integrated," Flowers said.

The ancient sandstone in the canyon walls contains grains of a phosphate mineral known as apatite -- hosting trace amounts of the radioactive elements uranium and thorium -- which expel helium atoms as they decay, she said. An abundance of the three elements, paired with temperature information from Earth's interior, provided the team a clock of sorts to calculate when the apatite grains were embedded in rock a mile deep -- the approximate depth of the canyon today -- and when they cooled as they neared Earth's surface as a result of erosion.

Apatite samples from the bottom of the Upper Granite Gorge region of the Grand Canyon yield similar dates as samples collected on the nearby plateau, said Caltech's Wernicke. "Because both canyon and plateau samples resided at nearly the same depth beneath the Earth's surface 55 million years ago, a canyon of about the same dimensions of today may have existed at least that far back, and possibly as far back as the time of dinosaurs at the end of the Cretaceous period 65 million years ago."

One of the most surprising results from the study is the evidence showing the adjacent plateaus around the Grand Canyon may have eroded away as swiftly as the Grand Canyon itself, each dropping a mile or more, said Flowers. Small streams on the plateaus appear to have been just as effective at stripping away rock as the ancient Colorado River was at carving the massive canyon.

"If you stand on the rim of the Grand Canyon today, the bottom of the ancestral canyon would have sat over your head, incised into rocks that have since been eroded away," said Flowers. The ancestral Colorado River was likely running in the opposite direction millions of years ago, she said.

When the canyon was formed, it probably looked like a much deeper version of present-day Zion Canyon, which cuts through strata of the Mesozoic era dating from about 250 million to 65 million years ago, Wernicke said. From 28 million to 15 million years ago, a pulse of erosion deepened the already-formed canyon and also scoured surrounding plateaus, stripping off the Mesozoic strata to reveal the Paleozoic rocks visible today, he said.

The prevailing belief is that the canyon was incised by an ancient river about six million years ago as the surrounding plateau began rising from sea level to the current elevation of about 7,000 feet. The new scenario described in the GSA Bulletin by Flowers and her colleagues is consistent with recent evidence by other geologists using radiometric dating techniques indicating the Grand Canyon is significantly older than scientists had long believed.

## And the First Animal on Earth Was a ...

***Evolutionary history of the comb jelly reveals surprising clues about Earth's first animal***

A new study mapping the evolutionary history of animals indicates that Earth's first animal--a mysterious creature whose characteristics can only be inferred from fossils and studies of living animals--was probably significantly more complex than previously believed.

The study, which was funded by the National Science Foundation (NSF), is the cover story of the April 10, 2008 issue of Nature. Using new high-powered technologies for analyzing massive volumes of genetic data, the study defined the earliest splits at the base of the animal tree of life. The tree of life is a hierarchical representation of the evolutionary relationships between species that was introduced by Charles Darwin. (See diagram).

***A comb jelly. The evolutionary history of the comb jelly has revealed surprising clues about Earth's first animal.*** **Casey Dunn**

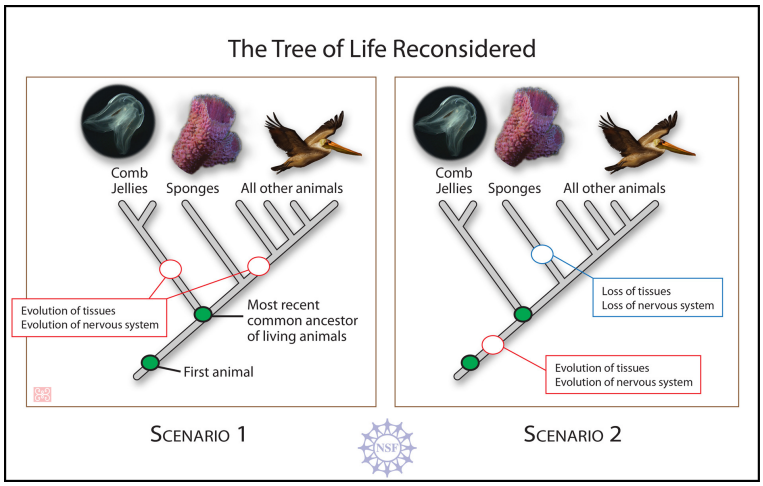
**Shaking Up the Tree of Life**

Among the study's surprising findings is that the comb jelly split off from other animals and diverged onto its own evolutionary path before the sponge. This finding challenges the traditional view of the base of the tree of life, which honored the lowly sponge as the earliest diverging animal. "This was a complete shocker," says Casey Dunn of Brown University. "So shocking that we initially thought something had gone very wrong."

But even after Dunn's team checked and rechecked their results and added more data to their study, their results still suggested that the comb jelly, which has tissues and a nervous system, split off from other animals before the tissue-less, nerve-less sponge.

The presence of the relatively complex comb jelly at the base of the tree of life suggests that the first animal was probably more complex than previously believed, says Dunn.

While cautioning that additional studies should be conducted to corroborate his team's findings, Dunn says that the comb jelly could only have achieved its apparent seniority over the simpler sponge via one of two new evolutionary scenarios: 1) the comb jelly evolved its complexity independently of other animals, after it branched off onto its own evolutionary path; or 2) the sponge evolved its simple form from more complex creatures--a possibility that underscores the fact that "evolution is not necessarily just a march towards increased complexity," says Dunn. "This scenario would provide a particularly dramatic example of that principle."




***The comb jelly could only have achieved its apparent seniority over the simpler sponge via one of two new evolutionary scenarios: 1) the comb jelly evolved its complexity independently of other animals, after it branched off onto its own evolutionary path; or 2) the sponge evolved its simple form from more complex creatures--a possibility that underscores the fact that evolution is not necessarily just a march towards increased complexity, says Dunn. This scenario would provide a particularly dramatic example of that principle.*** **Credit: Zina Deretsky, NSF**

**How Old is Old?**

How long ago did the earliest comb jelly diverge? "Unfortunately, we don't have fossils of the oldest comb jelly," laments Dunn. "Therefore, there is no way to date the earliest jelly and determine when it diverged."

After diverging from other species, the comb jelly probably continued to evolve, says Herendeen. Therefore, today's comb jelly--a common creature--probably looks very different that did the earliest comb jelly.

Moreover, the tentacled, squishy but bell-less comb jelly developed along a different evolutionary path than did the classically bell-shaped jellyfish, says Patrick Herendeen, an NSF program director. Such divergences mean that "the jellyfish type of body form has independently evolved several times," says Herendeen.

**Remaining Gaps in the Tree of Life**

While reversing the evolutionary order of the sponge and comb jelly, Dunn's study also resolved some long-standing questions about other species. Among these was whether millipedes and centipedes are more closely related to spiders than to insects. The answer: spiders.

But despite these and other important evolutionary insights provided by Dunn's team, the tree of life remains a work in progress. "Scientists currently estimate that there are a total of about 10 million species of organisms on earth," says Dunn. "But so far, only about 1.8 million species--most of which are animals--have been described by science. Very few of these species have, so far, been positioned in the tree of life."

**A Methodological Breakthrough**

But at least some of the tree of life's remaining gaps will likely be filled through the use of high-powered analytic approaches pioneered in Dunn's study--which involved using more than 100 computers to analyze

more data than incorporated into any previous comparable evolutionary study. "Dunn's high-powered approach is just what we need to continue assembling the tree of life," says Herendeen. "We are going to see a lot of this approach in the future."

Dunn explains one of the advantages of his team's approach: "Even though we looked at fewer than 100 species, they were sampled in such a way that they inform the relationships of major groups of animals relative to each other. Therefore, this study, and others like it, will have implications for the placement of far more species than just those that are sampled."

**Remaining Challenges**

But no matter how many high-tech analytic tools scientists use to analyze the genetics of organisms, they must still conquer "the exact same challenges that naturalists faced 200 years ago," says Dunn. "We still don't even know enough about many species to have a good idea where to look for them."

"And even as it is getting easier and cheaper to analyze the DNA of organisms with increasingly powerful computers, it is getting more expensive and difficult to find, collect, and identify organisms." For example, Dunn's team had to use remotely operated underwater vehicles to collect one of the comb jellies included in this study.

Dunn concludes: "It may come as a surprise to some that the many that huge advances in technology actually bring us right back to the same challenges that naturalists faced 200 years ago: the day-to-day practical challenges of just figuring out what lives on our planet, where to find it and how to collect it."

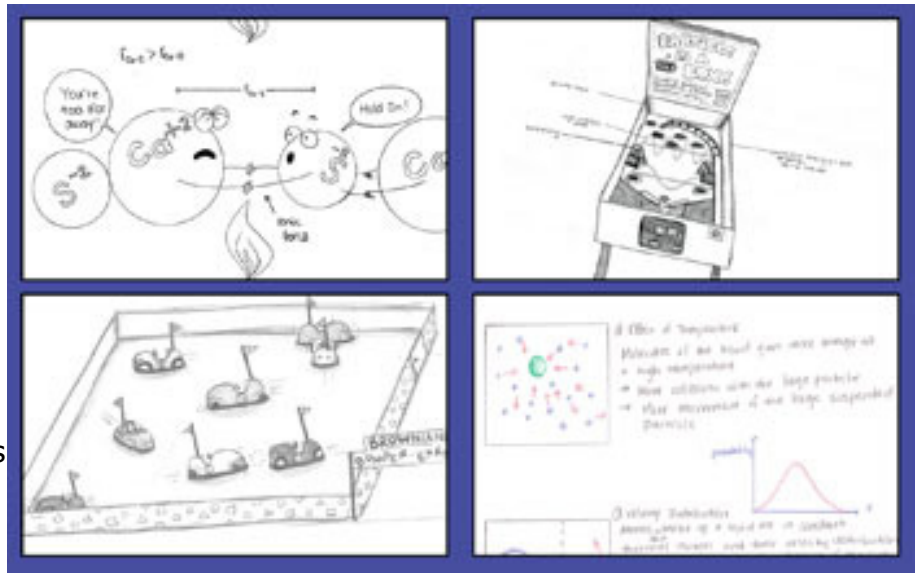
Dunn's research team included Gonzalo Giribet of Harvard University, Mark Martindale of the University of Hawaii and Ward Wheeler of the American Museum of Natural History. **-NSF-**

## Picture This: Explaining Science Through Drawings

***Undergrads master scientific concepts by explaining them to high schoolers through drawings***

If a picture is worth a thousand words, creating one can have as much value to the illustrator as to the intended audience. This is the case with "Picturing to Learn," a project in which college students create pencil drawings to explain scientific concepts to a typical high school student. The National Science Foundation (NSF), Division of Undergraduate Education, provides support for this effort.

What sets this project apart is its emphasis on inviting students to draw in order to explain scientific concepts to others. The act of creating pencil drawings calls into play a different kind of thought process that forces students to break down larger concepts into their constitutive pieces. This helps clarify the underlying science--from Brownian motion (the movement of particles suspended in a liquid or gas and the impact of raising the temperature of the liquid), to chemical bonding, to the quantum behavior of a particle in a box. In the same assignment, students are asked to evaluate their own drawings, which helps them identify and appreciate critical components. The act of creating pencil drawings helps students clarify the underlying science. The act of creating pencil drawings helps students clarify the underlying science.



***The act of creating pencil drawings helps students clarify the underlying science.***

"Visually explaining concepts can be a powerful learning tool," says Felice Frankel, principal investigator at Harvard University. "The other important part of this is that the teacher immediately identifies student misconceptions."

The project brings together five institutions: Harvard, the Massachusetts Institute of Technology (MIT), Duke University, Roxbury Community College and the School of Visual Arts in New York City. The students involved are undergraduates studying physics, chemistry and biology.

Each drawing assignment asks students to explain a science concept or process. For example, in addressing the question of how to identify which of two compounds has the higher boiling point, students are encouraged to be creative and to consider a variety of formats, including cartoons and stick figures. Students are also told, "In your drawing, strive for clarity in visually representing the concepts of bond type and strength."

Many of the drawings bring scientific concepts to life in interesting and unexpected ways. They also bring any misconceptions immediately to light so that professors can address them with students.

"I've been surprised and very pleased about the enthusiasm and excitement we've seen in some very renowned science professors," says Rebecca Rosenberg, the project manager and a former secondary school science teacher. "They could have pooh-poohed this idea, but instead, they're seeing how it helps inform their teaching."

Four Harvard physics majors will take their work to the next level on April 12, when they travel to New York City for a workshop with design students at the School of Visual Arts (SVA). The idea is to engage design students in conversation with science students so that each can learn from the other. In a previous workshop which involved students from SVA and MIT, the participants created an anthropomorphic metaphor, where "little guys" representing particles interacted with each other. As the students drew out the metaphor, they ultimately realized that this model wouldn't work. They scrapped it and started over, in the process developing a better understanding of both the concept and how to communicate it to others.

An eventual goal of the project is to expand it to students in middle school, high school and graduate school. In parallel, this approach is of growing interest to educators.

"This project promotes widespread adoption of these methods through workshops and publications," says Hal Richtol, NSF program manager. "Clearly it offers a useful teaching tool to anyone teaching science at any level."

*The students' work, and a description of the project, is accessible at http://www.picturingtolearn.org/.* **-NSF-**

## Journey to the center of the earth: Discovery sheds light on mantle formation

HOUSTON, April 10, 2008 – Uncovering a rare, two-billion-year-old window into the Earth's mantle, a University of Houston professor and his team have found our planet's geological history is more complex than previously thought.

Jonathan Snow, assistant professor of geosciences at UH, led a team of researchers in a North Pole expedition, resulting in a discovery that could shed new light on the mantle, the vast layer that lies beneath the planet's outer crust. These findings are described in a paper titled "Ancient, highly heterogeneous mantle beneath Gakkel Ridge, Arctic Ocean," appearing recently in Nature, the weekly scientific journal for biological and physical sciences research.

These two-billion-year-old rocks that time forgot were found along the bottom of the Arctic Ocean floor, unearthed during research voyages in 2001 and 2004 to the Gakkel Ridge, an approximately 1,000-mile-long underwater mountain range between Greenland and Siberia. This massive underwater mountain range forms the border between the North American and Eurasian plates beneath the Arctic Ocean, where the two plates diverge.

Jonathan Snow (left), assistant professor of geosciences at UH, inspects a haul of rocks scooped up from the floor of the Arctic Ocean found to date back two billion years.

Click here for more information.

These were the first major expeditions ever undertaken to the Gakkel Ridge, and these latest published findings are the fruit of several years of research and millions of dollars spent to retrieve and analyze these rocks.

The mantle, the rock layer that comprises about 70 percent of the Earth's mass, sits several miles below the planet's surface. Mid-ocean ridges like Gakkel, where mantle rock is slowly pushing upward to form new volcanic crust as the tectonic plates slowly move apart, is one place geologists look for clues about the mantle. Gakkel Ridge is unique because it features – at some locations – the least volcanic activity and most mantle exposure ever discovered on a mid-ocean ridge, allowing Snow and his colleagues to recover many mantle samples.

"I just about fell off my chair," Snow said. "We can't exaggerate how important these rocks are – they're a window into that deep part of the Earth."

Venturing out aboard a 400-foot-long research icebreaker, Snow and his team sifted through thousands of pounds of rocks scooped up from the ocean floor by the ship's dredging device. The samples were labeled and cataloged and then cut into slices thinner than a human hair to be examined under a microscope. That is when Snow realized he found something that, for many geologists, is as rare and fascinating as moon rocks – mantle rocks devoid of sea floor alteration. Analysis of the isotopes of osmium, a noble metal rarer than platinum within the mantle rocks, indicated they were two billion years old. The use of osmium isotopes underscores the significance of the results, because using them for this type of analysis is still a new, innovative and difficult technique.

Since the mantle is slowly moving and churning within the Earth, geologists believe the mantle is a layer of well-mixed rock. Fresh mantle rock wells up at mid-ocean ridges to create new crust. As the tectonic plates move, this crust slowly makes its way to a subduction zone, a plate boundary where one plate slides underneath another and the crust is pushed back into the mantle from which it came.

Because this process takes about 200 million years, it was surprising to find rocks that had not been remixed inside the mantle for two billion years. The discovery of the rocks suggests the mantle is not as well-

mixed or homogenous as geologists previously believed, revealing that the Earth's mantle preserves an older and more complex geologic history than previously thought. This opens the possibility of exploring early events on Earth through the study of ancient rocks preserved within the Earth's mantle.

The rocks were found during two expeditions Snow and his team made to the Arctic, each lasting about two months. The voyages were undertaken while Snow was a research scientist at the Max Planck Institute in Germany, and the laboratory study was done by his research team that now stretches from Hawaii to Houston to Beijing.

Since coming to UH in 2005, Snow's work stemming from the Gakkel Ridge samples has continued, with more research needed to determine exactly why these rocks remained unmixed for so long. Further study using a laser microprobe technique for osmium analysis available only in Australia is planned for next year.