

Deadly rugby virus spreads in sumo wrestlers

Rugby players may get more than just the ball out of a scrum – herpes virus can cause a skin disease called "scumpox" and it spreads through physical contact. Researchers have studied the spread of the disease among sumo wrestlers in Japan and have discovered that a new strain of the virus could be even more pathogenic, according to an article published in the October issue of the Journal of General Virology.

"Scumpox", or herpes gladiatorum, is a skin infection caused by the herpes virus, which can cause coldsores. It is spread through direct skin-to-skin contact so it is common among rugby players and wrestlers. Symptoms can start with a sore throat and swollen glands and the telltale blisters appear on the face, neck, arms or legs. The disease is highly infectious, so players who are infected are often taken out of competition to stop the virus from spreading.

"Scientists in Japan believe that a strain of herpes virus called BgKL has replaced the strain BgOL as one of the most common and pathogenic, causing a skin disease in sumo wrestlers," said Dr Kazuo Yanagi from the National Institute of Infectious Diseases in Tokyo, Japan. "We wanted to see if this is the case, so we studied the spread of the disease in sumo wrestlers in Tokyo."

The researchers looked at samples taken from 39 wrestlers diagnosed with herpes gladiatorum, who were living in 8 different sumo stables in Tokyo between 1989 and 1994. Tests showed that some of the cases were primary infections, being the first time the wrestlers had been infected. However, in some cases the disease had recurred several times.

"Herpes virus can hide in nerve cells for long periods of time and symptoms can reappear later," said Dr Yanagi. "Our research showed that the BgKL strain of herpes is reactivated, spreads more efficiently and causes more severe symptoms than BgOL and other strains. This is the first study to suggest that the recurrence of herpes gladiatorum symptoms in humans may depend on the strain of virus."

Professional sumo wrestlers live and train together in a stable called a heya. This makes studying the spread of herpes virus easier. Their living arrangement suggests that the source of primary herpes infections among sumo wrestlers in each stable was their fellow wrestlers.

"Two of the wrestlers died as a result of their infections, so cases like this do need to be investigated," said Dr Yanagi. "This research will aid future studies on herpes and may help identify herpes genes that are involved in recurrence and spread of the disease. We hope it will also contribute to the development of medicines to stop the disease from spreading and recurring in infected patients."

New study proves that pain is not a symptom of arthritis, pain causes arthritis

New treatments will seek to interrupt 'crosstalk' between joints and the spinal cord

Pain is more than a symptom of osteoarthritis, it is an inherent and damaging part of the disease itself, according to a study published today in journal Arthritis and Rheumatism. More specifically, the study revealed that pain signals originating in arthritic joints, and the biochemical processing of those signals as they reach the spinal cord, worsen and expand arthritis. In addition, researchers found that nerve pathways carrying pain signals transfer inflammation from arthritic joints to the spine and back again, causing disease at both ends.

Technically, pain is a patient's conscious realization of discomfort. Before that can happen, however, information must be carried along nerve cell pathways from say an injured knee to the pain processing centers in dorsal horns of the spinal cord, a process called nociception. The current study provides strong evidence that two-way, nociceptive "crosstalk" may first enable joint arthritis to transmit inflammation into the spinal cord and brain, and then to spread through the central nervous system (CNS) from one joint to another.

Furthermore, if joint arthritis can cause neuro-inflammation, it could have a role in conditions like Alzheimer's disease, dementia and multiple sclerosis. Armed with the results, researchers have identified likely drug targets that could interfere with key inflammatory receptors on sensory nerve cells as a new way to treat osteoarthritis (OA), which destroys joint cartilage in 21 million Americans. The most common form of arthritis, OA eventually brings deformity and severe pain as patients lose the protective cushion between bones in weight-bearing joints like knees and hips.

"Until relatively recently, osteoarthritis was believed to be due solely to wear and tear, and inevitable part of aging," said Stephanos Kyrkanides, D.D.S., Ph.D., associate professor of Dentistry at the University of Rochester Medical Center. "Recent studies have revealed, however, that specific biochemical changes contribute to the disease, changes that might be reversed by precision-designed drugs. Our study provides the first solid proof that some of those changes are related to pain processing, and suggests the mechanisms behind the effect," said Kyrkanides, whose work on genetics in dentistry led to broader applications. The common ground between arthritis and dentistry: the jaw joint is a common site of arthritic pain.

Study Details

Past studies have shown that specific nerve pathways along which pain signals travel repeatedly become more sensitive to pain signals with each use. This may be a part of ancient survival skill (if that hurt once, don't do it again). Secondly, pain has long been associated with inflammation (swelling and fever).

In fact, past research has shown that the same chemicals that cause inflammation also cause the sensation of pain and hyper-sensitivity to pain if injected. Kyrkanides' work centers around one such pro-inflammatory, signaling chemical called Interleukin 1-beta (IL-1 β), which helps to ramp up the bodies attack on an infection.

Specifically, Kyrkanides' team genetically engineered a mouse where they could turn up on command the production of IL-1 β in the jaw joint, a common site of arthritis. Experiments showed for the first time that turning up IL-1 β in a peripheral joint caused higher levels of IL-1 β to be produced in the dorsal horns of the spinal cord as well.

Using a second, even more elaborately engineered mouse model, the team also demonstrated for the first time that creating higher levels of IL-1 β in cells called astrocytes in the spinal cord caused more osteoarthritic symptoms in joints. Past studies had shown astrocytes, non-nerve cells (glia) in the central nervous system that provide support for the spinal cord and brain, also serve as the immune cells of CNS organs. Among other things, they release cytokines like IL-1 β to fight disease when triggered. The same cytokines released from CNS glia may also be released from neurons in joints, possibly explaining how crosstalk carries pain, inflammation and hyper-sensitivity back and forth.

In both mouse models, experimental techniques that shut down IL-1 β signaling reversed the crosstalk effects. Specifically, researchers used a molecule, IL-1RA, known to inhibit the ability of IL-1 β to link up with its receptors on nerve cells. Existing drugs (e.g. Kineret® (anakinra), made by Amgen and indicated for rheumatoid arthritis) act like IL-1RA to block the ability IL-1 β to send a pain signal through its specific nerve cell receptor, and Kyrkanides' group is exploring a new use for them as osteoarthritis treatment.

The implications of this process go further, however, because the cells surrounding sensory nerve cell pathways too can be affected by crosstalk. If 10 astrocytes secrete IL-1 β in response to a pain impulse, Kyrkanides said, perhaps 1,000 adjacent cells will be affected, greatly expanding the field of inflammation. Spinal cord astrocytes are surrounded by sensory nerve cells that connect to other areas of the periphery, further expanding the effect. According to Kyrkanides' model, increased inflammation by in the central nervous system can then send signals back down the nerve pathways to the joints, causing the release of inflammatory factors there.

Among the proposed, inflammatory factors is calcitonin gene related peptide (CGRP). The team observed higher levels calcitonin-gene related peptide (CGRP) production in primary sensory fibers in the same regions where IL-1 β levels rose, and the release of IL-1 β by sensory neurons may cause the release of CGRP in joints. Past studies in Kyrkanides reveal that CGRP can also cause cartilage-producing cells (chondrocytes) to mature too quickly and die, a hallmark of osteoarthritis.

Joining Kyrkanides in the publication from the University of Rochester School of Medicine and Dentistry were co-authors M. Kerry O'Banion, M.D., Ph.D., Ross Tallents, D.D.S., J. Edward Puzas, Ph.D. and Sabine M. Brouxon, M.D. Paolo Fiorentino was a student contributor and Jennie Miller was involved as Kyrkanides' technical associate. Maria Piancino, led a collaborative effort at the University of Torino, Italy. This work was supported in part by grants from the National Institutes of Health.

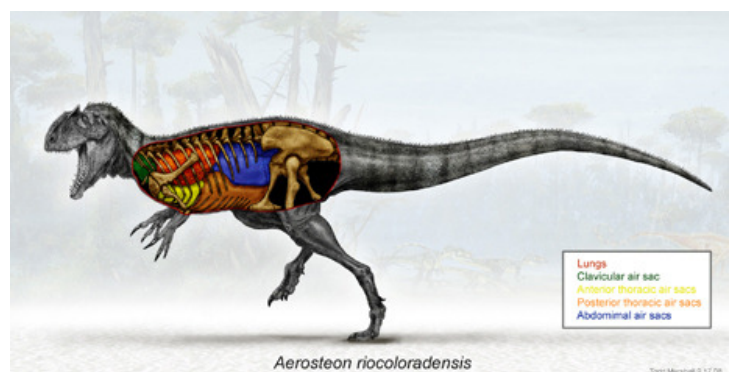
"Our study results confirm that joints can export inflammation in the form of higher IL-1 β along sensory nerve pathways to the spinal cord, and that higher IL-1 β inflammation in the spinal cord is sufficient in itself to create osteoarthritis in peripheral joints," Kyrkanides said. "We believe this to be a vitally important process contributing to orthopaedic and neurological diseases in which inflammation is a factor."

Meat-eating dinosaur from Argentina had bird-like breathing system

ANN ARBOR, Mich.--The remains of a 30-foot-long predatory dinosaur discovered along the banks of Argentina's Rio Colorado is helping to unravel how birds evolved their unusual breathing system.

University of Michigan paleontologist Jeffrey Wilson was part of the team that made the discovery, to be published Sept. 29 in the online journal Public Library of Science ONE and announced at a news conference in Mendoza, Argentina.

The discovery of this dinosaur builds on decades of paleontological research indicating that birds evolved from dinosaurs.



Birds have a breathing system that is unique among land animals. Instead of lungs that expand, birds have a system of bellows, or air sacs, which help pump air through the lungs. This novel feature is the reason birds can fly higher and faster than bats, which, like all mammals, expand their lungs in a less efficient breathing process.

Wilson was a University of Chicago graduate student working with noted dinosaur authority Paul Sereno on the 1996 expedition during which the dinosaur, named *Aerosteon riocoloradensis* ("air bones from the Rio Colorado") was found. Although the researchers were excited to find such a complete skeleton, it took on even more importance as they began to understand that its bones preserved hallmark features of a bird-like respiratory system.

Arriving at that understanding took some time. Laboratory technicians spent years cleaning and CT-scanning the bones, which were embedded in hard rock, to finally reveal the evidence of air sacs within *Aerosteon's* body cavity. Previously, paleontologists had found only tantalizing evidence in the backbone, outside the cavity with the lungs.

Wilson worked with Sereno and the rest of the team to scientifically describe and interpret the find. The vertebrae, clavicles, and hip bones bear small openings that lead into large, hollow spaces that would have been lined with a thin layer of soft tissue and filled with air in life. These chambers result from a process called pneumatization, in which outpocketings of the lungs (air sacs) invade the bones. Air-filled bones are the hallmark of the bellows system of breathing in birds and also are found in sauropods, the long-necked, long-tailed, plant-eating dinosaurs that Wilson studies.

"In sauropods, pneumaticity was key to the evolution of large body size and long necks; in birds it was key to the evolution of a light skeleton and flight," Wilson said. "The ancient history and evolutionary path of this feature is full of surprising turns, the explanations for which must account for their presence in a huge predator like *Aerosteon* and herbivores like *Diplodocus*, as well as in a chicken."

In the PLoS ONE paper, the team proposes three possible explanations for the evolution of air sacs in dinosaurs: development of a more efficient lung; reduction of upper body mass in tipsy two-legged runners; and release of excess body heat.

Sereno, a National Geographic Explorer-in-Residence, said he is especially intrigued by heat loss, given that *Aerosteon* was likely a high-energy predator with feathers but without the sweat glands that birds possess. At approximately 30 feet in length and weighing as much as an elephant, *Aerosteon* might well have used an air system under the skin to rid itself of unwanted heat.

In addition to Sereno and Wilson, coauthors of the PLoS ONE article include Ricardo Martinez and Oscar Alcober of the Universidad Nacional de San Juan, Argentina, David Varricchio of Montana State University and Hans Larsson of McGill University. The expedition that led to the discovery was supported by the National Geographic Society and The David and Lucille Packard Foundation.

*For more information: Jeffrey Wilson--- <http://www.ns.unich.edu/htdocs/public/experts/ExpDisplay.php?ExpID=1007>
<http://www-personal.umich.edu/~wilsonja/JAW/Home.html> National Geographic Society: <http://www.nationalgeographic.com/>*

MS patients have higher spinal fluid levels of suspicious immune molecule

St. Louis, Sept. 29, 2008 — A protein that helps keep immune cells quiet is more abundant in the spinal fluid of patients with multiple sclerosis (MS), further boosting suspicion that the protein, TREM-2, may be an important contributor to the disease.

More of an immune-control protein might seem like a boon to MS sufferers, whose symptoms are caused by misdirected immune attacks on the protective lining that coats nerve cell branches. But researchers at Washington University School of Medicine in St. Louis found the extra TREM-2 was not in the right place to reduce aggression in immune cells, a revelation that could eventually lead scientists to new pharmaceutical targets for MS prevention.

"Previously, TREM-2 had only been seen on the surface of immune cells; in the new study, we found it floating freely in spinal fluid," says lead author Laura Piccio, M.D., Ph.D., postdoctoral fellow. "This is only speculation for now, but these 'free agent' copies of TREM-2 could be making it harder for the TREM-2 that is attached to immune cells to keep the cells' aggressiveness under control."

Piccio explains that TREM-2 is a receptor protein, which means that another molecule activates it. Scientists don't currently know what that other molecule is, but the "free agent" TREM-2 in the spinal fluid could be binding to the molecule, reducing the chances that it will bind to and activate TREM-2 attached to immune cells. If Piccio and her colleagues can confirm their theory, the TREM-2 in the spinal fluid or its unknown partner could become targets for new MS treatments. The findings appear in the journal *Brain*.

Epidemiologists estimate that 400,000 people in the United States have MS. Symptoms, which often strike in episodic bursts, include bladder and bowel dysfunction, memory problems, fatigue, dizziness, depression,

difficulty walking, numbness, pain and vision problems. The disease is more common among Caucasians than any other group and affects two to three times as many women as men.

TREM-2 first came to MS researchers' attention because of Nasu-Hakola disease, a rare genetic disorder that involves a mutation in the gene for TREM-2. Among other symptoms, Nasu-Hakola causes loss of the same protective sheath around nerve cell branches that is damaged by MS.

One place where the TREM-2 protein commonly appears is the macrophage, an immune cell that performs a variety of functions, including cleaning up debris and emitting inflammatory signals that escalate immune attacks. Macrophages come in two classes: one that promotes inflammation and one that suppresses it. TREM-2 is present only on the anti-inflammatory macrophages.

Prior experiments had shown that activation of the TREM-2 receptor can help reduce immune inflammation and promote phagocytosis, a process that lets cells consume things. In the context of the central nervous system, researchers think this allows macrophages to consume dying nerve cells and to perform "housekeeping functions," such as shutting down inflammatory processes.

"The main thing we knew about MS and the function of TREM-2 before this study was that blocking TREM-2 in a mouse model of MS made their conditions worse," says senior author Anne Cross, M.D., professor of neurology and head of the neuroimmunology section.

After Piccio identified TREM-2 in the spinal fluid, she compared that form of the protein in patients with various types of MS, patients with other inflammatory diseases of the central nervous system, and patients with non-inflammatory central nervous system diseases. To ensure that the soluble TREM-2 wasn't seeping into the patients' spinal fluid from the bloodstream, they also analyzed TREM-2 levels in blood.

While there were no differences in blood levels, the soluble form of TREM-2 was significantly higher in the spinal fluid of MS patients.

Scientists are trying to develop a mouse line where the TREM-2 gene has been disabled to learn more about the protein's contributions to the immune system.

Piccio L, Buonsanti C, Cella M, Tassi I, Schmidt RE, Rinker II J, Naismith RT, Panina-Bordignon P, Passini N, Fenoglio C, Galimberti D, Scarpini E, Colonna M, Cross AH. Identification of soluble TREM-2 in the cerebrospinal fluid and its association with multiple sclerosis and CNS inflammation. Brain, September 13, 2008

Supplements no better than placebo in slowing cartilage loss in knees of osteoarthritis patients

SALT LAKE CITY – In a two-year multicenter study led by University of Utah doctors, the dietary supplements glucosamine and chondroitin sulfate performed no better than placebo in slowing the rate of cartilage loss in the knees of osteoarthritis patients.

This was an ancillary study concurrently conducted on a subset of the patients who were enrolled in the prospective, randomized GAIT (Glucosamine/chondroitin Arthritis Intervention Trial). The primary objective of this ancillary study was to investigate whether these dietary supplements could diminish the structural damage of osteoarthritis. The results, published in the October issue of *Arthritis & Rheumatism*, show none of the agents had a clinically significant effect on slowing the rate of joint space width loss —the distance between the ends of joint bones as shown by X-ray.

However, in line with other recent studies, the researchers observed that all the study's participants had a slower rate of joint space width loss than expected, making it more difficult to detect the effects of the dietary supplements and other agents used in the study.

Rheumatologist Allen D. Sawitzke, M.D., associate professor of internal medicine at the University of Utah School of Medicine, was lead investigator. "At two years, no treatment achieved what was predefined to be a clinically important reduction in joint space width loss," Sawitzke said. "While we found a trend toward improvement among those with moderate osteoarthritis of the knee in those taking glucosamine, we were not able to draw any definitive conclusions."

More than 21 million Americans have osteoarthritis, with many taking glucosamine and chondroitin sulfate, separately or in combination, to relieve pain. The original GAIT, led by University of Utah rheumatologist Daniel O. Clegg, M.D., professor of internal medicine, was a multicenter, randomized, national clinical trial that studied whether these dietary supplements provided significant pain relief to people with osteoarthritis in the knees. GAIT found that the supplements produced no more pain relief than placebo (*New England Journal of Medicine*, February 2006), although a subset of the original GAIT participants with moderate to severe osteoarthritis knee pain appeared to receive significant pain relief when they took a combination of glucosamine and chondroitin sulfate.

In this ancillary study, GAIT patients were offered the opportunity to continue their original study treatment for an additional 18 months, for a total of two years. Participants remained on their originally assigned GAIT

treatment: 500 mg of glucosamine three times a day; or 400 mg of chondroitin sulfate three times a day; or a combination of the two supplements; or 200 mg of celecoxib daily; or a placebo.

X-rays were obtained at study entry and again at one and two years. Joint space width was measured on 581 knees from 357 patients. None of the trial groups showed significant improvement. The group taking glucosamine had the least change in joint space width, followed by the groups taking chondroitin sulfate, celecoxib, placebo and the combination of both dietary supplements.

The total joint space width loss over two years for each group was:

- * 0.013mm (glucosamine)
- * 0.107mm (chondroitin sulfate)
- * 0.111mm (celecoxib)
- * 0.166mm (placebo)
- * 0.194mm (glucosamine and chondroitin sulfate)

The interpretation of the results was problematic because the placebo group's joint space width loss was much less at two years than the 0.4mm the researchers' expected. Based on other large studies published in scientific journals, the researchers hypothesized that a loss of 0.2mm or less at two years would mean a slowed rate of cartilage loss. However, because the reduction in rate of joint space loss for all the groups was under the 0.2mm threshold, the researchers concluded none of the agents significantly slowed the loss of joint space width.

Josephine P. Briggs, M.D., director of the National Center for Complementary and Alternative Medicine, one of the study's funders, said although no definitive conclusions can be drawn about the two dietary supplements yet, "the results of the study provide important insights for future research."

Clegg said the trial shed light on osteoarthritis progression, techniques that can more reliably measure joint space width loss, possible effects of glucosamine and chondroitin sulfate, and on identifying patients who may respond best as further studies are pursued.

The other centers in the study were: The Arthritis Research and Clinical Centers, Wichita, Kan.; University of Arizona, Tucson; Case Western Reserve University, Cleveland; Cedars-Sinai Medical Center; Los Angeles; Indiana University, Indianapolis; University of California, Los Angeles; University of California, San Francisco; University of Pittsburgh.

The National Institute of Arthritis and Musculoskeletal and Skin Diseases also funded the study. Both it and the National Center for Complementary and Alternative Medicine are part of the National Institutes of Health.

In the language of love, money talks

* 11:36 29 September 2008

* NewScientist.com news service

* **Ewen Callaway**

Money can't buy love, but it seems to earn you more babies. Rich men sire more children than paupers, according to a new study of thousands of middle-aged British men.

Women are more likely to marry men who can provide for them and their children than penniless men, says Daniel Nettle, a behavioural scientist at Newcastle University, UK, who led the new study.

"It's not that if you're richer you'll have more children – if you're richer you're less likely to be childless," he says.

For much of civilization, females have tended to mate with better providers, but many sociologists argue that the industrial and sexual revolutions have immunised people in developed countries such evolutionary pressures.

Census surveys have suggested that wealthier men have fewer kids, says Rosemary Hopcroft, a sociologist at the University of North Carolina in Charlotte, who is not affiliated with the study.

No more kids

However, these surveys are problematic because they tend to look at household income and tally only a mother's children, she says. The children of divorced and remarried men tend to get left out.

To correct for this bias, Nettle and Newcastle colleague Thomas Pollet looked at previously gathered data on more than 11,000 British men and women, all born between 3 and 9 March 1958, called the National Child Development Study.

The study has tracked income, marriage and fertility of study participants since birth. "It's a great resource," Nettle says.

Now that study participants have entered their late 40s – the study used data from 2004 – nearly all participants have stopped having children.

With carefully collected figures on male and female income and fertility, Nettle and Pollet found that, for men, the more money they make, the more kids they sire on average. Men who earn £10,000 a year fathered one child on average, while fathers who pulled in £50,000-plus sired more than two kids.

But rich men didn't have larger families, rather they are more likely to find mates, Nettle says.

Sexual selection

So despite the industrial revolution, gender equity, and birth control, rich and powerful men are more likely to pass on their genes than poorer and less powerful men.

"A deep aspect of the way human society works is that men with a lot of resources use their resources to achieve high reproductive success," says Nettle. "In a way, what we're saying in this paper is that a modern industrial society like Britain isn't so different."

The difference between modern Britain and medieval Europe or contemporary African hunter-gatherers is a matter of degree, not kind, he argues.

Human selection for male wealth even compares with sexual selection in animals for male traits favoured by females, Nettle and Pollet found. Based on a quantitative database of animal traits known to affect female choice, male wealth fell square in the middle.

The power of sexual selection for wealth in males compares to bill size in the large cactus finch, one of Darwin's Galapagos finches, Nettle says.

But while a peacock's tail or a bull's horns have an obvious basis in biology, male wealth is harder to pin to genetics, Nettle says. Ambition, intelligence and financial savvy probably have some heritable aspects, but social status, inheritance and upbringing are just as likely to affect a son's future income, he says. "We get so much from our parents, as humans, besides genetics."

Journal reference: The American Naturalist (November 2008)

Fuel thinner turns diesel cars into greener machines

* 16:41 29 September 2008

* NewScientist.com news service

* **Phil McKenna**

A small gadget that can be fitted to diesel engines boosts fuel efficiency by up to 19% and can make them run more cleanly, engineers report. A weak electric field is used to make fuel less viscous before it is injected into the engine. That makes it possible to spray smaller drops that burn more completely.

The device was developed at Temple University in Philadelphia, Pennsylvania and costs less than \$200 to produce. In tests over six months on a 2002 Mercedes-Benz 300D sedan, a prototype device increased fuel efficiency by 12 to 15% under urban driving conditions, and 19% in highway driving – taking it from 32 to 38 miles per gallon.

"This is the biggest efficiency increase since the advent of fuel injection," claims Rongjia Tao from Temple University. The device has been licensed to Californian firm Save the World Air, which is now testing it in road haulage vehicles.

Fluctuating flow

An electric field makes diesel thinner because some molecules in the fuel become charged and aggregate together, reducing their overall surface area. That means less friction between them, and a less viscous fuel.

Tao and colleagues believe fuel efficiency gains were lower under stop-start urban driving conditions because the rate at which fuel flows through their device constantly varies.

They are working on a version that varies its electric field to match fuel flow rate and keep viscosity constantly reduced.

Matt Thomas of CFD Research Corporation works on similar fuel electrification techniques. He says fitting the device to new cars will not produce such spectacular efficiency gains, but adds that it would still cut emissions. "[If] you charge spray prior to fuel injection you could lower particulate emissions by as much as a factor of 10." *Journal reference: Energy and Fuels (DOI: 10.1021/ef8004898)*

Private rocket achieves orbit on fourth try

* 18:10 29 September 2008

* NewScientist.com news service

* **Rachel Courtland**

After three failed attempts, the private space firm SpaceX successfully launched a rocket into orbit on Sunday, marking what may be the beginning of a significant drop in the cost of spaceflight.

The two-stage Falcon 1 rocket launched at 1115 GMT from Omelek Island on the Kwajalein Atoll in the Pacific Ocean, roughly 4000 kilometres southwest of Hawaii.

Paypal entrepreneur Elon Musk has said he founded SpaceX with the aim of driving down the cost of space access. The firm estimates that Falcon 1 flights will cost as little as \$7.9 million a piece, roughly three times less expensive than current launches. In an interview with New Scientist on Friday, Musk said if the launch was successful, "I won't need a rocket, because I'll be over the Moon."

The rocket's second stage achieved a stable orbit more than 500 km above Earth. The first stage, which the firm aims to make recoverable, is thought to have burned up when it re-entered the atmosphere.

Sunday's success is the firm's fourth attempt to reach orbit, but only the second test of its new, fuel-cooled Merlin 1C engine.

The firm lost the first such engine during a launch attempt on 3 August. The engine's first stage still had considerable thrust after it was shut down, which caused it to ram into the rocket's second stage after the two had separated.

No payload

The failure destroyed several payloads, including a \$3.5 million Pentagon-supported satellite called Trailblazer and two NASA projects totalling \$2.3 million. One, called PRESat, carried yeast for microgravity biology experiments. The other was NanoSail-D, a 9-square-metre solar sail that folded into a container the size of a loaf of bread. That rocket was also carrying the cremated remains of some 208 people, including Star Trek actor James Doohan and astronaut Gordon Cooper. This time, the Falcon 1 rocket carried a 165-kilogram mass simulator, meant to mimic the weight and heft of real payloads.



SpaceX launched its first liquid-fuel powered rocket into orbit Sunday. The firm hopes to drop the cost of space access (Image: SpaceX)

New age

The firm paid for the launch out of pocket, Musk told New Scientist. The previous three flights were paid for by the US Defense department.

Some industry watchers were delighted by the development. "[The] flight can be a bright glint of the new dawn for the Space Age that's just over the horizon," says aerospace consultant Charles Lurio.

SpaceX is competing for a NASA cargo delivery contract, which would allow the firm to send supplies to the space station when the shuttle retires in 2010.

Such cargo would be lofted into space in a capsule atop the firm's Falcon 9 rocket. SpaceX aims to install the rocket in Cape Canaveral, Florida, later this year and to launch it in mid-2009.

Private Company Launches Its Rocket Into Orbit

By JOHN SCHWARTZ

A privately financed company launched a rocket of its own design successfully into orbit on Sunday night, ushering in what the company's founders hope will be a new era of spaceflight.

It was the fourth launching attempt by the company, Space Exploration Technologies Corporation, which was founded by Elon Musk, an Internet entrepreneur born in South Africa.

"We've made orbit!" Mr. Musk exclaimed to his employees at the company's headquarters in Hawthorne, Calif., proclaiming the moment "awesome."

"There were a lot of people who thought we couldn't do it — a lot, actually," he said after thanking his employees. "But, you know, the saying goes, fourth time's the charm."

Mr. Musk, 37, founded SpaceX in 2002 after selling the online payment company he helped found, PayPal, to eBay for \$1.5 billion.

SpaceX, which has more than 500 employees, captured one of the most coveted prizes of the new space industry: a commercial orbital transportation services contract worth as much as \$100 million. Known by its acronym, Cots, the program encourages private-sector alternatives to the space shuttle.

The company is developing a larger rocket, the Falcon 9, to provide cargo services to the International Space Station for NASA after the shuttle program winds down in 2010. The company also hopes to adapt its technology to carry people to the station, which could help bridge the gap until the debut of the next generation of NASA spacecraft, planned for 2015.

"This is just the first step in many," Mr. Musk told his team.

His relief was obvious. The first three efforts by SpaceX had ended in failure. The first, in March 2006, failed about a minute into the ascent because of a fuel line leak. A second rocket, launched in March 2007, made it to space but was lost about five minutes after launching.

In the most recent flight, on Aug. 2, mission control lost contact with the craft shortly after the separation of the first stage. That third flight carried three small satellites for NASA and the Defense Department, as well as small amounts of the cremated remains of 200 people, including Gordon Cooper, one of the original seven Mercury astronauts, and James Doohan, who played the character Montgomery Scott on the original "Star Trek" television series.

Engineers identified the problem as a small amount of residual thrust from the first stage after the engine was cut off; the first stage rear-ended the second after separation. Mr. Musk said the company had fixed the problem by telling the rocket to wait a few more seconds after cut-off before jettisoning the first stage, a change that required rewriting a single line of computer code.

This time around, SpaceX took no chances with a customer's payload and instead launched what it called a payload mass simulator — a 364-pound weight — from the Kwajalein Atoll in the central Pacific Ocean at 7:16 p.m., Eastern time.

Those at headquarters cheered lustily at the launching, and even more so when the first and second stages separated successfully on live video that was also shown on the company's Web site, spacex.com. There was a long moment of concern as mission control lost contact with the craft as it neared orbital velocity, its engine nozzle glowing bright red. But the image reappeared, and the cheers resumed.

In a news conference after the launching, Mr. Musk told reporters, "It's great to have this giant monkey off my back."

Michael Griffin, the administrator of the NASA, said in an e-mail message in response to a request for comment on the launch, said "I am tremendously pleased for them." He added, "Practical commercial spaceflight remains a difficult goal, but one brought much closer with this step."

Nanotech and synbio: Americans don't know what's coming ***Landmark poll shows little knowledge of emerging technologies***

Washington, DC — A groundbreaking poll finds that almost half of U.S. adults have heard nothing about nanotechnology, and nearly nine in 10 Americans say they have heard just a little or nothing at all about the emerging field of synthetic biology, according to a new report released by the Project on Emerging Nanotechnologies (PEN) and Peter D. Hart Research. Both technologies involve manipulating matter at an incredibly small scale to achieve something new.

This new insight into limited public awareness of emerging technologies comes as a major leadership change is about to take hold in the nation's capital. Public policy experts are concerned, regardless of party, that the federal government is behind the curve in engaging citizens on the potential benefits and risks posed by technologies that could have a significant impact on society.

"Early in the administration of the next president, scientists are expected to take the next major step toward the creation of synthetic forms of life. Yet the results from the first U.S. telephone poll about synthetic biology show that most adults have heard just a little or nothing at all about it," says PEN Director David Rejeski. The poll findings are contained a report published today, *The American Public's Awareness Of And Perceptions About Potential Risks and Benefits of Nanotechnology & Synthetic Biology*, and available at: www.nanotechproject.org/n/synbio_poll. This page is limited access until the embargo is lifted. Login: synbio Password: advance

Synthetic biology is the use of advanced science and engineering to construct or re-design living organisms—like bacteria—so that they can carry out specific functions. This emerging technology is likely to develop rapidly in the coming years, much as nanotechnology did in the last decade. In the near future the first synthetic biology "blockbuster" drug is anticipated to hit the market—an affordable treatment for the 500 million people in the world suffering from malaria.

The poll, which was conducted by the same firm that produces the well-known NBC News/Wall Street Journal polls, found that about two-thirds of adults say they have heard nothing at all about synthetic biology, and only 2 percent say they have heard "a lot" about the new technology. Even with this very low level of awareness, a solid two-thirds of adults are willing to express an initial opinion on the potential benefits versus risks tradeoff of synthetic biology.

This survey was informed by two focus groups conducted in August in suburban Baltimore. This is the first time—to the pollsters' knowledge—that synthetic biology has been the subject of a representative national telephone survey.

At the same time, the poll found that about half of adults say they have heard nothing at all about nanotechnology. About 50 percent of adults are too unsure about nanotechnology to make an initial judgment on the possible tradeoffs between benefits and risks. Of those people who are willing to make an initial judgment, they think benefits will outweigh risks by a three to one margin when compared to those who believe risks will outweigh benefits. The plurality of respondents, however, believes that risks and benefits will be about equal. A major industry forecasting firm determined that last year nanotech goods in the global marketplace totaled \$147 billion. According to the poll, the level of U.S. public awareness about nanotechnology has not changed measurably since 2004 when Hart Research conducted the first poll on the topic on behalf of the PEN.

About Nanotechnology

Nanotechnology is the ability to measure, see, manipulate and manufacture things usually between 1 and 100 nanometers. A nanometer is one billionth of a meter; a human hair is roughly 100,000 nanometers wide. In 2007, the global market for goods incorporating nanotechnology totaled \$147 billion. Lux Research projects that figure will grow to \$3.1 trillion by 2015.

About Synthetic Biology

Synthetic biology is the use of advanced science and engineering to make or re-design living organisms, such as bacteria, so that they can carry out specific functions. Synthetic biology involves making new genetic code, also known as DNA, that does not already exist in nature.

The Project on Emerging Nanotechnologies is an initiative launched by the Woodrow Wilson International Center for Scholars and The Pew Charitable Trusts in 2005. It is dedicated to helping business, government and the public anticipate and manage possible health and environmental implications of nanotechnology. For more information about the project, log on to www.nanotechproject.org.

Marine 'dead zones' leave crabs gasping

* 22:00 29 September 2008

* NewScientist.com news service

* **Catherine Brahic**

It's not easy being a fish these days, but it could be even harder being a crab. Research into marine "dead zones" around the world suggests that crustaceans are the first to gasp for air when oxygen levels get low.

The findings, based on a review of 872 published studies of 206 ocean-floor dwelling species, also suggest that a much greater area than we thought is dangerously low on oxygen.

In marine dead zones – also known as hypoxic zones – the amount of dissolved oxygen in the water becomes too low for organisms to survive.

They are usually caused by synthetic fertilisers, which are carried from fields, down rivers, and out to sea, where algal blooms gorge on the extra nutrients. When these phytoplankton die, they fall to the bottom where they are eaten by bacteria that consume all the local oxygen in the process.

Marine biologists generally hold that any area that has less than 2 milligrams of dissolved oxygen per litre of seawater is hypoxic – "dead". The threshold was set by a study in 1983 in the Gulf of Mexico, when marine biologists found that fish and shrimp had deserted bottom waters that had 2 mg/l of oxygen or less.

Now Raquel Vaquer-Sunyer and Carlos Duarte of the Mediterranean Institute for Advanced Studies, Spain, have examined the validity of this threshold.

Local variation

The pair reviewed previously published laboratory experiments where bottom-dwelling animals including fish, crustaceans, molluscs and worms were placed in water containing different levels of oxygen to determine the critical levels.

They found that the minimum oxygen level varies widely between species. Studies suggest the American oyster (*Crassostrea virginica*) is able to survive for some time in waters that are entirely devoid of oxygen. But the larvae of the rock crab (*Cancer irroratus*) die if there is any less than 8.6 mg/l.

Overall, says Vaquer-Sunyer, if the aim is to preserve 90% of the bottom-dwelling biodiversity oxygen levels need to be 4.6 mg/l or higher. This is considerably more than the commonly adopted 2 mg/l threshold.

"I can't disagree with the conclusion that 2 mg/l is too low to protect all species. By the time you get to 2 mg/l, you start to see really serious effects," says Robert Diaz of the Virginia Institute of Marine Science.

"At 2.8 mg/l behavioural mechanisms start to kick in," he says. Animals that can flee, such as fast-swimming fish, do; sea urchins stand up as high as possible on their spines to reach a little higher above the sea floor.

Warming threat

Diaz says water-quality thresholds need to be set regionally. In Chesapeake Bay, Virginia – where levels of pollutants such as fertilisers and sewage are also monitored – he advised on a set of standards that vary according to depth and range between 1 mg/l and over 2 mg/l.

"What you want are criteria that are protective of the species in the area," he says.

The Gulf of Mexico, which has one of the world's largest seasonal dead zones, has no such standards.

In a review published in August, Diaz found that more than 245,000 square kilometres of ocean bed world wide have 2.8 mg/l of oxygen per litre of water or less (Science, DOI: 10.1126/science.1156401), making them dead zones.

If Vaquer-Sunyer and Duarte's conclusions are correct, the area affected could be much greater.

The situation is also predicted to get worse with climate change: warmer oceans can hold less dissolved oxygen. A recent study calculated that the area of hypoxic Danish coast could more than double over the coming century (Science, vol 320, p 655).

Journal reference: *Proceedings of the National Academy of Sciences* (DOI: 10.1073/pnas.0803833105)

Immigrant children from poor countries academically outperform those from developed countries

Sociological research also shows that children from small immigrant communities and children of politically motivated immigrants are at educational disadvantage

WASHINGTON, DC — Immigrants who seek a better life in Western countries may not be able to escape the influence of their home country when it comes to their children's academic performance, according to findings from the October issue of the *American Sociological Review*.

Sociologists Mark Levels, Jaap Dronkers and Gerbert Kraaykamp find that large-scale influences such as country of origin, destination country and immigrant community play a role in educational outcomes for immigrant children in their host country.

The research, which looked at the mathematical literacy scores of thousands of 15-year-old immigrants to 13 Western nations from 35 different native countries, indicates that economic development and political conditions in an immigrant's home country impact the child's academic success in his or her destination country. Counter-intuitively, immigrant children from countries with lower levels of economic development have better scholastic performance than comparable children who emigrate from countries with higher levels of economic development.

Children of immigrants from politically unstable countries have poorer scholastic performance compared to other immigrant children. "Adult political immigrants are known to face serious negative consequences that can be related to the political situations in their origin countries," said sociologist Mark Levels, junior researcher in the Department of Sociology at Radboud University, Nijmegen, in the Netherlands. "We found that these consequences carry across generations to affect their children's educational chances as well. Our findings therefore have urgent implications in countries that receive a large number of these immigrants."

"Specific educational programs designed to counter the negative effects of political migration may be essential to ensure that the children of politically motivated immigrants achieve their full potential," Levels said.

The study authors also analyzed the impact of policies and political conditions in destination countries. In traditional immigrant-receiving countries such as Australia and New Zealand, they found that immigrant children academically outperformed their counterparts in other Western nations. The authors theorize that this finding is likely the result of restrictive immigration policies that ensure that better qualified adults emigrate (e.g., those with employment and high levels of education), rather than a receptive climate toward immigrants or education policies designed to meet their needs.

The size and socioeconomic characteristics of immigrant communities also played a role in the academic performance of their children. Children from immigrant communities with higher socioeconomic status relative to the native population had higher scholastic performance than those from other immigrant communities. Likewise, children from large immigrant communities were more likely to perform better academically than children from smaller immigrant communities.

Data for this study came from the 2003 wave of the Project for International Student Assessment (PISA) from the Organization for Economic Co-operation and Development (OECD), the first large cross-national OECD dataset to contain information on the origin of first- and second-generation migrants. The sample was comprised of 7,403 15-year-old immigrant children from 35 different native countries living in 13 destination/host countries. Scholastic performance was based on PISA measurement of mathematical literacy scores.

Jaap Dronkers, professor of social inequality and stratification at the European University Institute in San Domenico di Fiesole, Italy, and Gerbert Kraaykamp, professor of empirical sociology at Radboud University, Nijmegen, co-authored the report with Mark Levels.

The research article, "Immigrant Children's Educational Achievement in Western Countries: Origin, Destination, and Community Effects on Mathematical Performance," is available by request for members of the media. Contact Jackie Cooper, ASA's Media Relations Officer, at jcooper@asanet.org or (202) 247-9871.

Treatment window expanded

Stroke patients benefit from dissolving a blood clot in the brain up to 4.5 hours after a stroke

Patients can still benefit up to 4.5 hours after a stroke if a drug that dissolves blood clots in the brain is administered. Thus far, three hours had been considered the useful limit for administering thrombolytic drugs. The results of the "European Cooperative Acute Stroke Study 3" (ECASS 3) have now been published in the "New England Journal of Medicine".

These new insights will benefit tens of thousands of patients whose cerebral circulation could be restored," said the study director, Professor Dr. Werner Hacke, Medical Director of the Neurology Clinic at Heidelberg University Hospital, who presented the study at the World Stroke Congress in Vienna.

A total of 826 patients in 130 European stroke centers who were treated in the clinic between 3 and 4.5 hours after a stroke were injected with either the thrombolytic drug alteplase or a placebo. Cerebral hemorrhage as a cause of the stroke was first ruled out by CT scan.

The earlier the treatment, the better the result

Around 52 percent of the patients treated with alteplase responded well to treatment and suffered no or only slight impairment, while in the placebo group, there were only 45 percent responders. The mortality rate was very low and identical in both groups (8 percent).

Based on these results, the researchers suggest treating stroke patients with thrombolytic drugs even after three hours. "But having more time does not mean that we can take more time", warned Professor Hacke. Patients with signs of a stroke should still be brought to the hospital and treated as soon as possible. Previous analyses clearly showed that patients respond best the earlier they received treatment.

But in addition to this, the study will set an important course – there had been no positive study on acute stroke therapy for more than 12 years, and ECASS 3 is just the second acute study ever to have a positive result for strokes. "This study will have an impact on the entire field of stroke treatment. It has finally been demonstrated again that stroke can be treated and this will encourage many researchers and companies to continue to work in this field", according to Professor Hacke.

About stroke: Every year, more than 250,000 people in Germany suffer a stroke and more than 10 million patients die annually from strokes all around the world, making it the second most frequent cause of death in the world, now ahead of cancer. As life expectancy increases, a dramatic increase in the incidence of strokes is expected in Germany, but even more so in developing countries. Stroke is not fate, it can be prevented and treated!

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References: Hacke W et al. Thrombolysis with alteplase 3 to 4.5 hours after acute ischemic stroke. 2008. *New England Journal of Medicine*, Sept. 25, Vol. 359, p. 1317-1329.

(The original article can be requested at the press office of Heidelberg University Hospital at contact@med.uni-heidelberg.de.)

Study reveals an oily diet for subsurface life

(Santa Barbara, Calif.) - Thousands of feet below the bottom of the sea, off the shores of Santa Barbara, single-celled organisms are busy feasting on oil.

Until now, nobody knew how many oily compounds were being devoured by the microscopic creatures, but new research led by David Valentine of UC Santa Barbara and Chris Reddy of Woods Hole Oceanographic Institution in Massachusetts has shed new light on just how extensive their diet can be.

In a report to be published in the Oct. 1 edition of the journal *Environmental Science & Technology*, Valentine, Reddy, lead author George Wardlaw of UCSB, and three other co-authors detail how the microbes are dining on thousands of compounds that make up the oil seeping from the sea floor.

"It takes a special organism to live half a mile deep in the Earth and eat oil for a living," said Valentine, an associate professor of earth science at UCSB. "There's this incredibly complex diet for organisms down there eating the oil. It's like a buffet."

Bubble of oil oozing from the ocean floor.

And, the researchers found, there may be one other byproduct being produced by all of this munching on oil - natural gas. "They're eating the oil, and probably making natural gas out of it," Valentine said. "It's actually a whole consortium of organisms - some that are eating the oil and producing intermediate products, and then those intermediate products are converted by another group to natural gas."

Reddy, a marine chemist at Woods Hole, said the research provides important new clues in the study of petroleum. "The biggest surprise was that microbes living without oxygen could eat so many compounds that compose crude oil," Reddy said. "Prior to this study, only a handful of compounds were shown, mostly in laboratory studies, to be degraded anaerobically. This is a major leap forward in understanding petroleum geochemistry and microbiology."

The diet of the single-cell microbes is far more diverse than previously thought, Valentine said. "They ate around 1,000 of the 1,500 compounds we could trace, and presumably are eating many more," he said.

Research for this project began seven years ago and much of the testing was done at one of the planet's best natural labs. "We have the world's most prolific hydrocarbon seep field sitting right offshore of Santa Barbara,



about two miles out," Valentine said. "We have something on the order of 100 barrels of oil a day coming up from the sea floor."

The source of this oil seepage is near Platform Holly, but it's not being caused by the drilling. "It's just oil that is naturally oozing out, probably has been for thousands of years," Valentine explained. "Holly just happens to be near some of these seepage areas, which is fortuitous because we were able to get samples from about a mile deep."

By studying samples from the subsurface, the ocean floor, the mid-water, and then from the surface, the researchers could determine how much of the oil was being degraded and digested by the microbes.

Using a new technique devised by Reddy, the scientists were able to pick apart the differences in the makeup of the oil, which is migrating to the surface through faults from deep below the sea floor. The microbes prefer the lighter compounds of oil, the gasoline part of the black goo. They tend to leave behind the heavily weathered residue, which is what makes its way to the surface and, sometimes, to the beaches in the form of tar.

"There always seems to be a residue," Valentine said. "They (bacteria) hit a wall. There seems to be stages in which they eat. There's the easy stuff - the steak. And then they work their way to the vegetables, and then garnish, and then they stop eating after awhile. Just depends on how hungry they are and what's fed to them."

Reddy's new diagnostic technology is called a comprehensive two-dimensional gas chromatography (GCxGC). Typically, chromatography involves heating up a sample and putting it into a column around 60 meters long. Compounds are then separated based on their boiling points, which works well with light crude oil, Valentine said. But, with the two-dimensional test, the compounds are put into a cooled trap, for about 10 seconds, and a flash pulse of hot air releases them into the second column. This two-dimensional separation allows the researchers to pick out the many thousands of compounds.

"This new technology was actually too good at its job," Reddy said. "It was able to separate and help identify significantly more compounds in the oil samples than traditional analytical techniques. The end result was that we were handcuffed with too much data afforded by the GCxGC. However, we overcame this hurdle by using new algorithms to help us interpret the data, which in turn led us to these milestone discoveries."

The next steps in their research are already under way, according to Valentine. They are following the oil diet in controlled laboratory conditions, and tracking the fate of the oil once it forms a slick at the sea surface.

"When you fly out of the Santa Barbara Airport, you can look down and see these massive slicks," Valentine said. "You can follow them for about 20 miles. A lot of the oil comes up on the beaches, but then what happens to it after that? Certainly the microorganisms continue to act on it. Evaporation occurs, but most of it can't evaporate. Some of it breaks down from sunlight. So where does the rest of it end up? We want to know how far the organisms will go in eating the oil and what happens to the residual tar. It doesn't all stick to our feet and there must be a lot of it out there somewhere."

Wardlaw, the lead author of this paper, is a graduate student in the Marine Science program at UCSB. The other co-authors were J. Samuel Arey of the Swiss Federal Institute of Technology, and G. Todd Ventura and Robert K. Nelson, both of Woods Hole Oceanographic Institution.

Funding for this research was provided by the National Science Foundation, the Department of Energy, and the U.S. Minerals Management Service.

Applying Science to Alternative Medicine

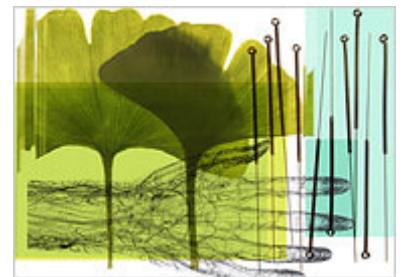
By **WILLIAM J. BROAD**

More than 80 million adults in the United States are estimated to use some form of alternative medicine, from herbs and megavitamins to yoga and acupuncture. But while sweeping claims are made for these treatments, the scientific evidence for them often lags far behind: studies and clinical trials, when they exist at all, can be shoddy in design and too small to yield reliable insights.

Now the federal government is working hard to raise the standards of evidence, seeking to distinguish between what is effective, useless and harmful even dangerous.

"The research has been making steady progress," said Dr. Josephine P. Briggs, director of the National Center for Complementary and Alternative Medicine, a division of the National Institutes of Health. "It's reasonably new that rigorous methods are being used to study these health practices."

The need for rigor can be striking. For instance, a 2004 Harvard study identified 181 research papers on yoga therapy reporting that it could be used to treat an impressive array of ailments — including asthma, heart disease, hypertension, depression, back pain, bronchitis, diabetes, cancer, arthritis, insomnia, lung disease and high blood pressure.



It turned out that only 40 percent of the studies used randomized controlled trials — the usual way of establishing reliable knowledge about whether a drug, diet or other intervention is really safe and effective. In such trials, scientists randomly assign patients to treatment or control groups with the aim of eliminating bias from clinician and patient decisions.

Sat Bir S. Khalsa, the study's author and a sleep researcher at the Harvard Medical School, said an added complication was that "the vast majority of these studies have been small," averaging 30 or fewer subjects per arm of the randomized trial. The smaller the sample size, he warned, the greater the risk of error, including false positives and false negatives.

Critics of alternative medicine have seized on that weakness. R. Barker Bausell, a senior research methodologist at the University of Maryland and the author of "Snake Oil Science" (Oxford, 2007), says small studies often have a built-in conflict of interest: they need to show positive results to win grants for larger investigations.

"All these things conspire to produce false positives," Dr. Bausell said in an interview. "They make the results extremely questionable."

That kind of fog is what Dr. Briggs and the National Center for Complementary and Alternative Medicine, with a budget of \$122 million this year, are trying to eliminate. Their trials tend to be longer and larger. And if a treatment shows promise, the center extends the trials to many centers, further lowering the odds of false positives and investigator bias.

For instance, the center is conducting a large study to see if extracts from the ginkgo biloba tree can slow the progression of Alzheimer's disease. The clinical trials involve centers in California, Maryland, North Carolina and Pennsylvania and recruited more than 3,000 patients, all of them over 75. The study is to end next year.

Another large study enrolled 570 participants to see if acupuncture provided pain relief and improved function for people with osteoarthritis of the knee. In 2004, it reported positive results. Dr. Brian M. Berman, the study's director and a professor of medicine at the University of Maryland, said the inquiry "establishes that acupuncture is an effective complement to conventional arthritis treatment."

In an interview, Dr. Briggs said another good way to improve clinical trials was to ensure product uniformity, especially on herbal treatments. "We feel we have really influenced the standards," she said.

Over the years, laboratories have found that up to 75 percent of the samples of ginkgo biloba failed to show the claimed levels of the active ingredient. Scientists doing a clinical trial have a large incentive to fix that kind of inconsistency.

Dr. Briggs said such investments would be likely to pay off in the future by documenting real benefits from at least some of the unorthodox treatments. "I believe that as the sensitivities of our measures improve, we'll do a better job at detecting these modest but important effects" for disease prevention and healing, she said.

An open question is how far the new wave will go. The high costs of good clinical trials, which can run to millions of dollars, means relatively few are done in the field of alternative therapies and relatively few of the extravagant claims are closely examined.

"In tight funding times, that's going to get worse," said Dr. Khalsa of Harvard, who is doing a clinical trial on whether yoga can fight insomnia. "It's a big problem. These grants are still very hard to get and the emphasis is still on conventional medicine, on the magic pill or procedure that's going to take away all these diseases."

Eureka! How distractions facilitate creative problem-solving

How many times have you spent hours slaving over an impossible problem, only to take a break and then easily solve the problem, sometimes within minutes of looking at it again? Although this is actually a common phenomenon, up until now the way that this occurs has been unclear. But new research in the September issue of *Psychological Science*, a journal of the Association for Psychological Science, demonstrates the answer is more complex than simply having an "Aha!" moment.

The new research, led in part by Kellogg School of Management Professor Adam Galinsky, suggests that unconscious thought results in creative problem-solving via a two-step process.

According to Galinsky and fellow psychologists Chen-Bo Zhong from the University of Toronto and Ap Dijksterhuis of Radboud University Nijmegen, distractions may be helpful in coming up with creative solutions to a certain problem, but must be followed by a period of conscious thought to ensure that we are aware of those solutions and can apply them. Likewise, while distractions are more useful in solving difficult problems, it may be better to stay focused on finding the solution when confronted with easier problems.

The researchers conducted two experiments to test their idea. In the first experiment, 94 subjects participated in a Remote-Association Test (RAT), which tests for creativity. In this test, participants were presented with three words (a triad) and were asked to come up with a fourth word that is linked with all three words. For example, if presented with the words cheese, sky and ocean, the correct answer would be blue (blue cheese,

blue sky, blue ocean). Subjects were shown nine very difficult triads (but were instructed not to solve them yet) and were then divided into groups. For five minutes following the RAT, participants were either concentrating on the triads they had just seen (the conscious thought group) or engaging in a test completely unrelated to the RAT (the unconscious thought group). Following the five-minute interval, all of the subjects participated in a lexical decision test. During this test, subjects were shown sequences of letters and had to indicate as quickly as possible if the sequences were English words or not. The sequences presented included answers to the RAT triads, random words and non-words. Finally, subjects were again shown the RAT items and had to write down their answers.

The second experiment involved 36 subjects and had a similar set up to the previous experiment, although the RAT triads presented were much easier to solve compared to those in the first experiment.

The results showed that in the first experiment, during the lexical decision test, members of the unconscious thought group had much faster responses to letter sequences which were answers to RAT items, compared to the conscious thought group. However, when it came time to solve the RAT problems, both groups had similar results. In the second experiment (using an easier set of RAT triads), the conscious thought group had more correct RAT answers compared to the unconscious thought group, but there was no difference in response time during the lexical decision test.

“Conscious thought is better at making linear, analytic decisions, but unconscious thought is especially effective at solving complex problems,” said Galinsky and his co-authors. “Unconscious activation may provide inspirational sparks underlying the ‘Aha!’ moment that eventually leads to important discoveries.”

MORE INFORMATION: To see the full article, published in the September 2008 issue of Psychological Science, or to arrange an interview with Professor Adam Galinsky, contact Meg Washburn at the Kellogg School of Management at (773) 848 - 4461, or at m-washburn@kellogg.northwestern.edu.

Driving Fatalities Surge on US Presidential Election Days

Sunnybrook researcher Dr. Donald Redelmeier and Stanford University statistician Robert Tibshirani have found an increased risk of fatal motor vehicle crashes on United States (US) presidential election days.

“We thought efforts that mobilize about 55 per cent of the population to vote, along with US reliance on motor vehicle travel, might result in increased fatal motor vehicle crashes during US presidential elections,” says Redelmeier, lead investigator of the study and staff physician at Sunnybrook Health Sciences Centre, “indeed, we found a significant increase in traffic deaths on election days.”

The investigation looked at all US presidential election days over the last 32 years, from Jimmy Carter in 1976 to George Bush in 2004, during the hours of polling. They also looked at the same hours on the Tuesday immediately before and immediately after as control days. Their main finding was that the average presidential election led to about 24 deaths from motor vehicle crashes.

Explanations for the increased risk include speed, distance, distraction, emotions, unfamiliar pathways traveling to polls, and the potential mobilization of unfit drivers. "A 4 per cent increase in average driving speed," says Redelmeier, "would be sufficient by itself to account for the 18 per cent observed increase in fatal motor vehicle crashes."

“What these findings suggest is the immediate need for safety reminders by electioneers who encourage people to get out to vote,” says Redelmeier, also a professor of medicine at the University of Toronto. “Good advice would be to avoid excess speed, alcohol, and other distractions as well as to ensure seatbelt use.”

Other interventions worth considering might include subsidized public transportation, voting centers within walking distances, tamper-proof remote voting, or more traffic enforcement on election day. "In light of these findings, the US president owes a larger debt to the American people than is generally recognized" says Redelmeier.

The results of the study are published in the October 1, 2008 issue of the Journal of the American Medical Association.

Vitamin C supplements may reduce benefit from wide range of anti-cancer drugs

PHILADELPHIA – In pre-clinical studies, vitamin C appears to substantially reduce the effectiveness of anticancer drugs, say researchers at Memorial Sloan-Kettering Cancer Center.

These new findings, published in the October 1 issue of Cancer Research, a publication of the American Association of Cancer Research (AACR), came from studying laboratory cancer cells and mice, but the study's authors say the same mechanism may affect patient outcomes, although they add this premise needs to be tested.

"The use of vitamin C supplements could have the potential to reduce the ability of patients to respond to therapy," said Heaney, an Associate Attending Physician at Memorial Sloan-Kettering Cancer Center.

Use of vitamin C during cancer treatment has been controversial. Some studies have suggested that because vitamin C is an antioxidant it might be beneficial to cancer patients. But some classes of chemotherapy drugs produce "oxygen free radicals," unpaired oxygen molecules that can fatally react with other molecules in a cell,

forcing cell death. In this theory, vitamin C could sop up the radicals, keeping the cancer cell alive despite chemotherapy treatment.

Heaney and his colleagues tested a wide variety of chemotherapy drugs – those that produce reactive oxygen and those that work in other ways – on cancer cells in the laboratory, that were pretreated with dehydroascorbic acid (DHA), the form that ascorbic acid (vitamin C) takes to enter cells.

They found to their surprise that every chemotherapy drug they tested – which included targeted agents like Gleevec – did not work as well if cells were pretreated with vitamin C, as they did on untreated cancer cells. In the cell culture experiments, 30 to 70 percent less cancer cells treated with vitamin C were killed depending on the drug tested.

They then checked these findings by implanting the cancer cells into mice, and again found that, in an animal model system, while chemotherapy kept untreated cancer in check, tumors grew more rapidly in mice that were given cancer pretreated with vitamin C.

The research team, which includes researchers from Columbia University, then delved into the mechanism by which vitamin C may be protecting these cells, and discovered that it wasn't because the nutrient was neutralizing oxygen-free radicals.

They found instead that DHA was restoring viability to the cancer cell's damaged mitochondria – the cell's all-important power plant that, when injured, sends signals to force a cell to die.

"Vitamin C appears to protect the mitochondria from extensive damage, thus saving the cell," Heaney said. "And whether directly or not, all anticancer drugs work to disrupt the mitochondria to push cell death."

Heaney says that the amount of DHA used in the experiments resulted in an intracellular buildup similar to what could be seen in cancer patients using large supplemental doses of vitamin C.

Researchers at Memorial Sloan-Kettering Cancer Center have long been researching the connection between vitamin C and cancer therapy, and these new findings expand on their earlier observation that vitamin C seems to accumulate within cancer cells more than in normal cells.

"We recognized that DHA is the form of vitamin C that gets into cells, and that the tumor microenvironment allows cancer cells to convert more vitamin C into DHA," he said. "Inside the cell, DHA is converted back into ascorbic acid, and it gets trapped there and so is available to safeguard the cell."

Heaney says that he suspects that vitamin C is good for the cells of normal tissue because it provides more protection for the mitochondria, and thus probably extends cell life. "But that isn't what you want when you are trying to eliminate cancer cells," said Heaney, who notes that cancer patients should eat a healthy diet, which includes foods rich in vitamin C. It is use of large doses of over-the-counter vitamin C that is worrisome, he says.

Asian-white couples face distinct pregnancy risks, Stanford/Packard

STANFORD, Calif. - Pregnant women who are part of an Asian-white couple face an increased risk of gestational diabetes as compared with couples in which both partners are white, according to a new study from Lucile Packard Children's Hospital and the Stanford University School of Medicine.

The researchers also found that Asian women whose partners are white are more likely than white women with Asian or white partners to have a caesarean delivery, as part of a broad analysis of perinatal outcomes among Asian, white and Asian-white couples.

The study will be published in the October issue of American Journal of Obstetrics and Gynecology. The findings, the authors say, could benefit clinicians working with an increasingly diverse patient population.

"There's great heterogeneity in our country; there are people of many different races and backgrounds," said co-author Yasser El-Sayed, MD, a Packard Children's Hospital obstetrician and associate professor of obstetrics and gynecology at the medical school. "Gaining better insight into the risks facing specific populations provides for better counseling and better prenatal care."

It's difficult to estimate the prevalence of Asian-white couples, but 14.3 percent of Americans reporting Asian race in the U.S. Census Bureau's 2000 survey also reported being of mixed Asian-white ancestry.

Although past studies have looked at ethnic differences in perinatal outcomes, the majority of research has focused on white- African-American couples. Few studies have focused specifically on Asian-white couples, said El-Sayed, who is also associate chief of maternal-fetal medicine.

To learn more about outcomes and risks in this population, the researchers looked at data from white, Asian and Asian-white couples who delivered at the Johnson Center for Pregnancy and Newborn Services at Packard Children's from 2000 through 2005. (During that time period, 5,575 white, 3,226 Asian and 868 Asian-white couples delivered babies at the hospital.) The team recorded the type of delivery - caesarean vs. vaginal - and examined perinatal outcomes including gestational diabetes, hypertensive disorders of pregnancy, preterm delivery and birth weight.

El-Sayed and his colleagues found, as noted in their paper, that Asian- white couples "represent a population with distinct perinatal risks that differ depending upon which parent is of Asian race."

More specifically, the researchers found that white mother/Asian father couples had the lowest rate (23 percent) of caesarean delivery, while Asian mother/white father couples had the highest rate (33.2 percent). Because birth weights between these two groups were similar, the researchers say the findings suggest that the average Asian woman's pelvis may be smaller than the average white woman's and less able to accommodate babies of a certain size. (Asian couples had babies with the lowest median birth weight, so caesarean delivery was less common among those women.)

It's important for clinicians to know which women may have an increased risk of caesarean delivery, so they can conduct proper counseling prior to childbirth, El-Sayed said.

El-Sayed and his colleagues also found that the incidence of gestational diabetes was lowest among white couples at 1.61 percent and highest among Asian couples at 5.73 percent - and just under 4 percent for Asian-white couples. These findings weren't altogether surprising: past studies have shown an increased risk of diabetes among Asian couples, which researchers attribute to an underlying genetic predisposition. But the interesting finding, El-Sayed said, was that the risk for interracial couples was about the same regardless of which parent was Asian.

Based on their findings, El-Sayed said clinicians should consider both maternal and paternal race when determining a patient's risk for perinatal complications. "One has to factor in as many relevant variables as possible when you counsel a patient about pregnancy," he said. "We've shown in this paper that if you have an interracial couple, depending on which parent is of which race, there may be different relative risks of certain outcomes that could inform and enhance clinical management."

Noting the growing number of interracial couples in the San Francisco Bay Area and beyond, El-Sayed said he expects to see more outcomes research like this in the future. "These kinds of studies will become increasingly common," he said.

Michael Nystrom, MD, who was a resident at Stanford when the research was done and is now a resident at UC-San Francisco, was first author of the paper. El-Sayed's other co-authors were Stanford faculty Deirdre Lyell, MD, and Maurice Druzin, MD; and Aaron Caughey, MD, from UCSF.

Logging On for a Second (or Third) Opinion

By JOHN SCHWARTZ

Correction Appended

When Terri Nelson learned she had a large fibroid tumor in her uterus, she went online.

There is nothing new in that, of course. The intrepid and the adept were going to the Web for health information as long ago as the 1980s, well before Google and other search engines made it accessible to a wider audience.



Nola Lopez, with Bryan Christie

These days, that is pretty much everyone. At least three-quarters of all Internet users look for health information online, according to the Pew Internet and American Life Project; of those with a high-speed connection, 1 in 9 do health research on a typical day. And 75 percent of online patients with a chronic problem told the researchers that "their last health search affected a decision about how to treat an illness or condition," according to a Pew Report released last month, "The Engaged E-Patient Population."

Reliance on the Internet is so prevalent, said the report's author, Susannah Fox, the associate director at Pew, that "Google is the de facto second opinion" for patients seeking further information after a diagnosis.

But paging Dr. Google can lead patients to miss a rich lode of online resources that may not yield to a simple search. Sometimes just adding a word makes all the difference. Searching for the name of a certain cancer will bring up the Wikipedia entry and several information sites from major hospitals, drug companies and other providers. Add the word "community" to that search, Ms. Fox said, and "it's like falling into an alternate universe," filled with sites that connect patients.

As a result, said Dr. Ted Eytan, medical director for delivery systems operations improvement at the Permanente Federation, "patients aren't learning from Web sites — they're learning from each other." The shift is nothing less than "the democratization of health care," he went on, adding, "Now you can become a national expert in your bedroom."

These expanded capabilities allow people to share information easily, upending the top-down path of information between doctors and patients. Today, said Clay Shirky, an expert in the evolving online world, patients are “full-fledged actors in the system.”

And they have plenty of company. Benjamin Heywood, the president of PatientsLikeMe.com, a site that allows patients to track and document their conditions and compare notes with other patients, says that with a growing online population, it becomes possible to research highly specific conditions — say, being a 50-year-old with multiple sclerosis who has leg spasms and is taking a certain combination of drugs.

“We are really about measuring value in the real world,” he said.

There are so many sites today and the landscape is changing so rapidly that it would take an encyclopedia rather than a newspaper to list them. But they can be grouped into five broad, often overlapping, categories: **GENERAL INTEREST** Sites like WebMD (webmd.com), Discovery Health (health.discovery.com) and The New York Times (nytimes.com/health) provide information about disease, news and lifestyle advice, as do medical institutions like the Mayo Clinic (mayoclinic.com).

MEDICAL RESEARCH SITES offer access to the published work of scientists, studies and a window into continuing research. Examples include PubMed (ncbi.nlm.nih.gov/pubmed) from the National Library of Medicine; clinicaltrials.gov, which tracks federally financed studies; [psycinfo \(apa.org/psycinfo\)](http://psycinfo.apa.org/psycinfo), with its trove of psychological literature; and the National Center for Complementary and Alternative Medicine (nccam.nih.gov), the government’s registry on alternative medicine research.

PATIENT SITES for groups and individuals are booming — so much so that they are increasingly used by researchers to find patients for studies. These include the Association of Cancer Online Resources (acor.org) and e-patients (e-patients.net), as well as Patients Like Me and Trusera (trusera.com), which provide a bit of Facebook-style social connectivity for patients, along with the ability to share their stories in clinical, data-laden detail.

DISEASE-SPECIFIC SITES focus on a particular condition and are often sponsored by major organizations like the American Heart Association (americanheart.org), the American Cancer Society (cancer.org) and the American Diabetes Association (diabetes.org). But smaller groups can put together extensive resources as well, with sites like breastcancer.org and Diabetes Mine (diabetesmine.com), which calls itself the “all things diabetes blog.”

WEB TOOLS These sites help people manage their conditions — for example, sugarstats.com for diabetes, Destination Rx (drx.com) for comparing drug prices, and YourDiseaseRisk.com, a service of the Washington University school of medicine that helps patients determine their risk for various problems.

All of the changes in the Internet and the ways people use it help explain why Terri Nelson’s experience in 2008 is very different from what it might have been in 1998.

Ms. Nelson, who lives in Portland, Ore., received her diagnosis on Aug. 11. She had two weeks before a follow-up visit with her surgeon. Ms. Nelson and her husband, Stewart Loving-Gibbard, used the time to research fibroids and the most common treatments.

Ms. Nelson started with straightforward information gathering, checking the articles on fibroid tumors at sites that included the Mayo Clinic and PubMed. Then she reached out to the community of people with fibroid tumors at ACOR and other sites. (“Those had to be evaluated carefully,” she said, “to find the nuggets of valid information in the vast sea of online hypochondria.”)

Having spent many years trolling roisterous online forums, however, she had developed that essential Internet tool: what might be called a personal baby/bathwater algorithm that helps people to sift through mountains of information to find what is relevant. She found a blog for the layperson, “Inquisitive Geek With Fibroid Tumors,” that featured wide-ranging discussions and, she said, “was really useful” and specific to her condition.

By the time she went into the consultation with her surgeon, she knew that the old-school way of dealing with her grapefruit-size tumor would probably have been a hysterectomy. But that can impair sexual response, among other side effects; a growing number of doctors prefer abdominal myomectomy, which leaves the uterus intact. The surgeon laid out the options and recommended that approach as well, confirming Ms. Nelson’s research.

During the surgery and recovery, Mr. Loving-Gibbard used Twitter, the short-message communication service, to keep friends and family apprised of her condition. Twittering an operation might seem frivolous, but when Ms. Nelson’s teeth began chattering after the procedure, a friend following the updates suggested it could be a potentially hazardous side effect, tardive dyskinesia, that can occur with one of the anti-nausea drugs Ms. Nelson was taking. Mr. Loving-Gibbard, who had been researching that very point when the message from the friend, Ken Yee, came in, was able to get the medication changed.

After the procedure, they posted photographs of the surgery and tumor on the photo-sharing site Flickr.com under the heading “Extracting a Pound of Flesh” (flickr.com/photos/littlecrumb/sets/72157607218121711/).

They are not for the squeamish, but as Ms. Nelson said, “My husband’s family is mostly doctors, so they were all interested in seeing the photos, and most of my friends are morbidly fascinated.”

As patients go online to share information and discuss their care, they are becoming something more: consumers. Amy Tenderich, the creator of Diabetes Mine has turned her site into a community for diabetes patients and an information clearinghouse for treatments and gadgets — even going so far as to publish an open letter last year to Steven Jobs, the Apple Computer co-founder, challenging him to design medical devices like insulin pumps that are as sleek and easy to use as an iPod.

Dr. Talmadge E. King Jr., chairman of the department of medicine at the University of California, San Francisco, says doctors are coming around to seeing the value of a patient who has gone online for information.

Patients in his pulmonary practice, he said, sometimes come into his office holding medical journal articles he has written “and quiz me.” The better-educated patient might stump the doctor, he went on, but these days “it’s much easier for me to look them straight in the eye and say, ‘I don’t know’ ” and promise to get back to them. “Patients know you’re not all-knowing,” he said. “They’re not upset by that.”

Can online information be trusted? The answer, increasingly, is yes. In a study earlier this year, a report in the journal *Cancer* looked at 343 Web pages about breast cancer that came up in online searches. The researchers found 41 inaccurate statements on 18 sites — an error rate of 5.2 percent. Sites promoting alternative medicine were 15 times as likely to offer false or misleading health information as those sites that promoted conventional medicine, the study found.

Matthew Holt, who with Indu Subaiya created a conference, Health 2.0, that showcases innovation, says the marketplace in information can correct itself over time. “In the end,” he said, “the more people you have in the conversation, the better information drives out the worse information.”

This article has been revised to reflect the following correction:

Correction: October 1, 2008

An article on Tuesday about online research into health-care topics misstated the Web address for one site, e-patients. It is e-patients.net.

Health on the Web

A Google search for "cancer" returns 299 million results; narrow that to, say, "prostate cancer" and you still get 12.7 million. It's a vast, bewildering world out there, but here's a look at six of the most interesting and potentially useful online health resources. - JASCHA HOFFMAN

Web Site

PubMed www.ncbi.nlm.nih.gov/pubmed

Created more than a decade ago by the National Library of Medicine, PubMed includes millions of citations from medical journals dating to the 1950s. Doctors and students have learned to rely on the database to track studies. Patients, on the other hand, may be overwhelmed by the flood of results: more than 500 abstracts crop up when the system translates a naïve query for "causes of bad breath" into "etiology of halitosis." But if you know what you're looking for, and how to make sense of it, PubMed is a power tool without peer. A free log-in allows easier filtering, and a new iPhone application holds the promise of a second opinion right there in the waiting room.

Visualdxhealth.com visualdxhealth.com

The art of diagnosis is subtle. But when it comes to skin conditions, sometimes the answer is right there in front of your eyes. Enter the Skin Disease Finder at visualdxhealth.com, a kind of Flickr for bites, boils, cysts, moles, rashes, sores, warts and more — even the hard-to-describe skin infections caused by MRSA. Drawn from an even larger visual library sold by Logical Images in Rochester, this free dermatological atlas will satisfy all but the most fiendish amateur skin detective. You can select a location as precise as scalp, cheek, toenail or “finger webspace,” or you can shoot the moon by clicking on “widespread rash.” Presto, a sort of lineup of skin diseases appears, with instantly recognizable mug shots that enable anyone to tell eczema from rosacea, shingles from ringworm, scabies from psoriasis. The whole thing is certainly more thrilling than a visit to the dermatologist’s office — especially if you don’t have a rash.

San Francisco City Clinic sfcityclinic.org

San Francisco City Clinic, which offers low-cost testing and treatment for sexually transmitted diseases, is also a bracing and realistic source of information. Its front page comes on gently with a little box marked “About You.” This leads to a customized list of diseases one can get as, say, a middle-age transsexual who sleeps with both men and women. For those who would rather see all the risks at once, a handy chart of “S.T.D. basics” catalogs the infections that can be transmitted by nine kinds of sexual activity. Bay Area residents can

consult an exhaustive catalog of local resources. For the rest of us there is the clinic's "Dr. K," whose advice columns reveal, for example, that two condoms are not better protection than one.

Clinical Trials clinicaltrials.gov

Looking for experimental treatment? With more than 25,000 open trials testing a dizzying variety of new drugs, surgeries and vaccines, this site may have something for everyone. The upside is bargain-priced treatment; inpatient volunteers can be well compensated. The downside is that you may be pumped full of an untested drug with serious effects. (You may get a placebo.) By and large, the trials sponsored by universities and the National Institutes of Health are more likely to be monitored for safety than those offered by private companies.

Patients Like Me patientslikeme.com

If you learned you had a life-changing illness, broadcasting it on the Internet might be the last thing on your mind. But PatientsLikeMe encourages people to do just that. Founded by Ben and James Heywood after their brother Stephen received a diagnosis of Lou Gehrig's disease, the site is a kind of Facebook for the chronically ill. It holds thousands of profiles of patients living with diseases as diverse as multiple sclerosis, Parkinson's and H.I.V., with a special section for mood disorders like depression and anxiety. Patients can use slick visual tools to chart their symptoms over time, rate their drugs and treatments, and track their progress against fellow patients with a degree of transparency that borders on the voyeuristic. Users should be aware that the site shares data, stripped of names and other identifying material, with nonprofit groups, research hospitals and pharmaceutical companies.

Mayo Clinic mayoclinic.com

It may be tough to get an appointment at the Mayo Clinic, which for over a century has set the standard for medical care in America. But it's much easier to consult its encyclopedic site, which may be the most concise source of medical information on the Web. Unlike many other health sites, Mayo writes its own material, with a tone that manages to be both conversational and precise, straightforward and sympathetic. ("Suicide is the act of taking your own life. ... You may think suicide is a solution when, in fact, it's not.") The no-nonsense symptom checker, while remarkably simple to use, should probably be kept away from hypochondriacs. (Wheezing and drooling? You may have epiglottitis. Dizzy and stumbling? Might be ataxia.) The site could be easier to navigate, but the guide to ailments is so terse and authoritative that you may find yourself reading it for pleasure.

You're Sick. Now What? Knowledge Is Power.

By TARA PARKER-POPE

Are patients swimming in a sea of health information? Or are they drowning in it?

The rise of the Internet, along with thousands of health-oriented Web sites, medical blogs and even doctor-based television and radio programs, means that today's patients have more opportunities than ever to take charge of their medical care. Technological advances have vastly increased doctors' diagnostic tools and treatments, and have exponentially expanded the amount of information on just about every known disease.

The daily bombardment of news reports and drug advertising offers little guidance on how to make sense of self-proclaimed medical breakthroughs and claims of worrisome risks. And doctors, the people best equipped to guide us through these murky waters, are finding themselves with less time to spend with their patients.

But patients have more than ever to gain by decoding the latest health news and researching their own medical care.

Illustration by Nola Lopez, with Anatomical Images by Bryan Christie

"I don't think people have a choice — it's mandatory," said Dr. Marisa Weiss, a breast oncologist in Pennsylvania who founded the Web site breastcancer.org. "The time you have with your doctor is getting progressively shorter, yet there's so much more to talk about. You have to prepare for this important meeting."

Whether you are trying to make sense of the latest health news or you have a diagnosis of a serious illness, the basic rules of health research are the same. From interviews with doctors and patients, here are the most important steps to take in a search for medical answers.

Determine your information personality.

Information gives some people a sense of control. For others, it's overwhelming. An acquaintance of this reporter, a New York father coping with his infant son's heart problem, knew he would be paralyzed with



indecision if his research led to too many choices. So he focused on finding the area's best pediatric cardiologist and left the decisions to the experts.

Others, like Amy Haberland, 50, a breast cancer patient in Arlington, Mass., pore through medical journals, looking not just for answers but also for better questions to ask their doctors.

"Knowledge is power," Ms. Haberland said. "I think knowing the reality of the risks of my cancer makes me more comfortable undergoing my treatment."

Dr. Michael Fisch, interim chairman of general oncology for the University of Texas M. D. Anderson Cancer Center, says that before patients embark on a quest for information, they need to think about their goals and how they might react to information overload.

"Just like with medicine, you have to ask yourself what dose you can take," he said. "For some people, more information makes them wackier, while others get more relaxed and feel more empowered."

The goal is to find an M.D., not become one.

Often patients begin a medical search hoping to discover a breakthrough medical study or a cure buried on the Internet. But even the best medical searches don't always give you the answers. Instead, they lead you to doctors who can provide you with even more information.

"It's probably the most important thing in your cancer care that you believe someone has your best interests at heart," said Dr. Anna Pavlick, director of the melanoma program at the New York University Cancer Institute. "In an area where there are no right answers, you're going to get a different opinion with every doctor you see. You've got to find a doctor you feel most comfortable with, the one you most trust."

Keep statistics in perspective.

Patients researching their health often come across frightening statistics. Statistics can give you a sense of overall risk, but they shouldn't be the deciding factor in your care.

Jolanta Stettler, 39, of Denver, was told she had less than six months to live after getting a diagnosis of ocular melanoma, a rare cancer of the eye that had spread to her liver.

"I was told there is absolutely nothing they could help me with, no treatment," said Ms. Stettler, a mother of three. "I was left on my own."

Ms. Stettler and her husband, a truck driver, began searching the Internet. She found Dr. Charles Nutting, an interventional radiologist at Swedish Medical Center in Englewood, Colo., who was just beginning to study a treatment that involves injecting tiny beads that emit small amounts of radiation. That appeared to help for about 18 months.

When her disease progressed again, Ms. Stettler searched for clinical trials of treatments for advanced ocular melanoma, and found a National Institutes of Health study of "isolated hepatic perfusion," which delivers concentrated chemotherapy to patients with liver metastases. After the first treatment, Ms. Stettler's tumors had shrunk by half.

"I don't like statistics," she said. "If this study stops working for me, I'll go find another study. Each type of treatment I have is stretching out my life. It gives me more time, and it gives more time to the people who are working really hard to come up with a treatment for this cancer."

Don't limit yourself to the Web.

There's more to decoding your health than the Web. Along with your doctor, your family, other patients and support groups can be resources. So can the library. When she found out she had Type 2 diabetes in 2006, Barbara Johnson, 53, of Chanhassen, Minn., spent time on the Internet, but also took nutrition classes and read books to study up on the disease.

"I was blindsided — I didn't know anybody who had it," said Ms. Johnson, who told her story on the American Heart Association's Web site, IKnowDiabetes.org. "But this is a disease you have to manage yourself."

Tell your doctor about your research.

Often patients begin a health search because their own doctors don't seem to have the right answers. All her life, Lynne Kaiser, 44, of Plano, Tex., suffered from leg pain and poor sleep; her gynecologist told her she had "extreme PMS." But by searching the medical literature for "adult growing pains," she learned about restless legs syndrome and a doctor who had studied it.

"I had gone to the doctors too many times and gotten no help and no results," said Ms. Kaiser, who is now a volunteer patient advocate for the Web site WhatIsRLS.org. The new doctor she found "really pushed me to educate myself further and pushed me to look for support."

Although some doctors may discourage patients from doing their own research, many say they want to be included in the process.

Dr. Fisch of M. D. Anderson recalls a patient with advanced pancreatic cancer who decided against conventional chemotherapy, opting for clinical trials and alternative treatments. But instead of sending her away, Dr. Fisch said he kept her in the “loop of care.” He even had his colleagues use a mass spectroscopy machine to evaluate a blue scorpion venom treatment the patient had stumbled on. It turned out to be just blue water.

“We monitored no therapy like we would anything else, by watching her and staying open to her choices,” Dr. Fisch said. “She lived about a year from the time of diagnosis, and she had a high quality of life.”

Dr. Shalom Kalnicki, chairman of Radiation Oncology at the Montefiore-Einstein Cancer Center, says he tries to guide his patients, explaining the importance of peer-reviewed information to help them filter out less reliable advice. He also encourages them to call or e-mail him with questions as they “study their own case.”

“We need to help them sort through it, not discourage the use of information,” he said. “We have to acknowledge that patients do this research. It’s important that instead of fighting against it, that we join them and become their coaches in the process.”

Mars Weather Forecast: Snow

By KENNETH CHANG

The latest findings from the Martian Arctic offer more hints of a wet past but paint a very arid present, scientists reported Monday.

And in a prelude to winter and the demise of NASA’s Phoenix Mars lander, snow has been spotted falling from the clouds above. As the Martian days shorten and temperatures drop, Phoenix’s solar panels will eventually not be able to produce enough energy to keep the spacecraft warm.

NASA, however, has given a second extension to the mission, originally intended to last just three months and now in its fifth month. The extension will allow scientists to gather data until Phoenix’s final day, anticipated to arrive in mid- to late-November or perhaps early December.

“We are trying to literally make hay as the sun shines,” said Barry Goldstein, Phoenix’s project manager during a news conference on Monday, “and really try to get the most of the science instruments in these last few days before the end of the mission.”

The Phoenix landed north of the Martian Arctic circle on May 25, during late spring for Mars’ northern hemisphere. Its mission was to explore whether that environment, currently dry, cold and presumably lifeless, might have been habitable in the past when Mars’ axis was tipped farther over and pointed toward the Sun half of the time.

The mission has produced a trove of data for scientists to sift and ponder, but no blockbuster discoveries.

Instruments analyzing samples of dirt dug up by the Phoenix have now identified signs of clays and calcium carbonate, materials that on Earth form only in the presence of liquid water.

That liquid water is not there currently. A layer of water ice exists a few inches below surface, and the layer of soil on top of the ice is “very, very dry,” said Michael Hecht of NASA’s Jet Propulsion Laboratory.

Earlier, scientists had announced the presence of perchlorates, a class of chemicals that are toxic in high concentrations, although the implications for the possibility of life are unclear. The perchlorates could also explain the dryness of the soil, soaking up any moisture. No organic molecules have yet been identified. “If there is any there, it’s not very much,” said William V. Boynton of the University of Arizona, lead scientist of the instrument known as the thermal and evolved gas analyzer.

The weather station, by shining a laser beam straight up and looking at the reflections, has spotted crystals of water ice - snow - from clouds 2.5 miles above the surface, although the snow has so far not reached the ground.

As the season moves to winter, the Phoenix will eventually be encased in a tomb of carbon dioxide ice. Mission managers said that after the spacecraft thaws out when spring returns, they will attempt to invoke its “Lazarus mode,” but they doubted the spacecraft would revive.

Mr. Goldstein said the extreme cold would make electronic components brittle and prone to shattering. “The vehicle will probably not survive that,” he said.

Short RNAs show a long history

MicroRNAs are found in animals that appeared a billion years ago

CAMBRIDGE, Mass. (Oct. 1, 2008) – MicroRNAs, the tiny molecules that fine-tune gene expression, were first discovered in 1993. But it turns out they've been around for a billion years.

Evidence reported in Nature on October 1 by scientists in the lab of Whitehead Member and Howard Hughes Medical Institute investigator David Bartel provides a window into the early evolution of these key regulators, placing their origin within the earliest of animal lineages. The research also suggests that microRNAs present early on have undergone extensive changes, which likely have altered their functions across various lineages.

"This is the first evidence that microRNAs were present within the earliest animal lineages and are not just characteristic of more complex animals," says Andrew Grimson, a postdoctoral fellow in Bartel's lab. Scientists knew that microRNAs existed within bilaterians, an evolutionary group that includes everything from worms to fruit flies to humans, he explains. "Remarkably, we discovered their presence within sponge, a member of the earliest diverging group of animals."

The scientists used high-throughput sequencing to probe samples from animals that diverged before the origin of bilaterian animals. The sponge (*Amphimedon queenslandica*) represents a group of animals that split off in evolution very early, whereas the starlet sea anemone (*Nematostella vectensis*) split off more recently.

The sequences of microRNAs within each lineage were different from each other, suggesting that microRNA functions are almost certainly very different in these different lineages. "In a relatively narrow spectrum of evolution microRNAs are often conserved," says Grimson. "But in a broader spectrum they have completely changed. This suggests that microRNA evolution is more flexible and may be evolving more rapidly than suspected."

Researchers also pinpointed piRNAs, another class of small RNAs, among these two species. Although less is known about piRNAs, they characteristically have longer sequences than microRNAs and are thought to dampen the activity of transposons—chunks of DNA that can move around the genome, causing mutations.

"It appears that both microRNAs and piRNAs have been available to shape gene expression throughout the evolution of animals and perhaps even helped to usher in the era of multicellular animal life," says Bartel. *David Bartel is a Member at Whitehead Institute for Biomedical Research, where his laboratory is located and all his research is conducted. He is also a Howard Hughes Medical Institute Investigator and a professor of biology at Massachusetts Institute of Technology.*

Full citation: Nature on-line, Oct. 1, 2008 "The Early Origins and Evolution of microRNAs and piRNAs in Animals"

Urbanization in Africa at dawn of 20th century marked outbreak of HIV

UA-led research indicates the HIV/AIDS pandemic began around 1900 in sub-Saharan Africa, decades earlier than first thought

New research indicates that the most pervasive global strain of HIV began spreading among humans between 1884 and 1924, suggesting that growing urbanization in colonial Africa set the stage for the HIV/AIDS pandemic.

The estimated period of origin, considerably earlier than the previous estimate of 1930, coincides with the establishment and rise of urban centers in west-central Africa where the pandemic HIV strain, HIV-1 group M, emerged. The growth of cities and associated high-risk behaviors may have been the key change that allowed the virus to flourish.

The research, led by Michael Worobey, an assistant professor of ecology and evolutionary biology at The University of Arizona in Tucson, was co-sponsored by the National Institute of Allergy and Infectious Diseases (NIAID), part of the National Institutes of Health, and the David and Lucile Packard Foundation. The findings are published in the current issue of the journal *Nature*.

Worobey and his collaborators screened a number of tissue samples and uncovered the world's second-oldest genetic sequence of HIV-1 group M, which dates from 1960. They then used it, along with dozens of other previously known HIV-1 genetic sequences, to construct a range of plausible family trees for this viral strain. The lengths of the tree branches represent the periods of time when the virus genetically diverged from its ancestors.

The timing and number of these genetic mutations enabled the scientists to calibrate the probable range of rates at which the trees have grown. That is, the probable rates of evolution of HIV-1 group M. Based on this range of rates, the scientists projected back in time to the period when the trees most likely took root: around the turn of the 20th century. This marks the probable time of origin of HIV-1 group M, according to Worobey and the others.

Using newly developed techniques, the scientists recovered the 48-year-old HIV gene fragments from a wax-embedded lymph-node tissue biopsy from a woman in Kinshasa in the Democratic Republic of the Congo. The oldest known HIV-1 group M genetic sequence comes from a 1959 blood sample from a man, also from Kinshasa. A comparison of the same genetic region in the 1959 virus and the 1960 virus provided additional evidence that the common ancestor of both viruses existed around 1900. The comparison revealed that the amount of genetic divergence between these two HIV sequences took more than 40 years to evolve.

Worobey, who teaches the evolution of infectious diseases and molecular phylogenetics at the UA, has spent several years studying how to recover the fragmented pieces of viral DNA and RNA from archival specimens, to track when the virus first jumped from chimpanzees to humans.

"Previous work on HIV sequencing had been done on frozen samples and there are only so many of those samples available," Worobey said. The 1959 and 1960 samples are presently the oldest links to the HIV epidemic.

"From that point on, the next oldest sequences that anyone has recovered are from the late 1970s and 1980s, the era when we knew about AIDS. Now for the first time we have been able to compare two relatively ancient HIV strains. That helped us to calibrate how quickly the virus evolved and make some really robust inferences about when it crossed into humans, how quickly the epidemic grew from that time and what factors allowed the virus to enter and become a successful human pathogen."

Research shows that HIV spread from chimps to humans in southeastern Cameroon. Worobey said the resulting HIV epidemic among humans correlates to the growth of urban centers near this area, principally the present-day city of Kinshasa in the Democratic Republic of the Congo, which began as a colonial center for Belgium. Other countries ringing this area include the Central African Republic, Congo, Gabon and Equatorial Guinea.

By 1960 a large number of people in this region were infected with HIV, reflected by the considerable amount of genetic diversity of the virus. From there events seeded the epidemic in different parts of the world. By 1981, people started realizing that something was happening and the rest is history.

Worobey said laying the technical groundwork for analyzing samples of HIV's ancient history was extraordinarily painstaking.

"The DNA and RNA in these samples is in a really sorry state. It's highly fragmented, so instead of a nice, pearl-strand of DNA or RNA, you have a jumbled mass that's all jammed together. It's been gratifying, but a ridiculous amount of work."

Worobey said his research in the near term will be on recovering more samples and assembling the fragmented DNA and RNA sequences to form a clearer picture of HIV's history. He said the Nature paper "does a lot to snap everything into sharp focus and allows us to understand the timing of these events and the growth of the epidemic."

"There's still a lot of interesting work we can do with these techniques. We have lots more samples to analyze and hopefully recover nucleic acids from and it's pretty exciting to be in that position," Worobey said.

"I think the picture that has emerged here, where changes the human population experienced may have opened the door to the spread of HIV, is a good reminder that we can make changes now that could help reverse the epidemic. If HIV has one weak spot, it is that it is a relatively poorly transmitted virus. From better testing and prevention, to wider use of antiretroviral drug therapy, there are a number of ways to reduce transmission and force this virus back into extinction. Our results suggest that there are reasons for such optimism."

Worobey's colleagues on the paper include Marlea Gemmel, Dirk E. Teuwen, Tamara Haselkorn, Kevin Kunstman, Michael Bunce, Jean-Jacques Muyembe, Jean-Marie M. Kabongo, Raphael M. Kalengayi, Eric Van Marck, M. Thomas P. Gilbert and Steven M. Wolinsky.

Lunar endurance mission to act as 'boot camp' for Mars

* 21:54 01 October 2008

* NewScientist.com news service

* **Paul Marks, Glasgow**

NASA chief Mike Griffin has outlined the punishing lunar endurance mission that would have to be completed before NASA could ever consider sending humans to Mars.

Speaking on NASA's future mission priorities at this week's International Astronautical Congress in Glasgow, Scotland, Griffin said that Mars is not automatically the next destination simply because humans have already been to the Moon (see NASA urged to focus on sending people to Mars).

He believes that we have too little knowledge of the Moon to head straight for the Red Planet.

"The total human experience on the Moon is less than 27 human working days – on a world that is the size of Africa," he says. "So whether the Moon is a stepping stone to Mars or a place of interest in its own right depends on knowledge we don't have yet."

To improve that knowledge, and to test the logistics and human factors of potential Mars missions in the bargain, Griffin proposes an elaborate lunar mission experiment. It would mimic the travel and landing time of a Mars mission by using the International Space Station as a mock Mars spaceship – and the Moon as a surrogate Mars.

No care packages

"The experiment would consist of placing a crew on the space station for say seven or eight months, then taking them from the station and landing them on the Moon and asking them to survive there for nine months to a year, with no further assistance other than what they have brought," says Griffin.

"After that, return them to the space station for another six or seven months and then back to Earth. All with no extra assistance – because that is what it will be like when we go to Mars," Griffin continued. "Unless we can do that experiment successfully, the first crew to go to Mars will not come back."

Griffin is not alone in this uncompromising view. A raft of space agencies, such as the China National Space Administration and the European Space Agency, want to cooperate on crewed Mars missions in the future, potentially using the ISS and the Moon as staging posts.

"I fully agree with what Mike says," says Jean-Jacques Dordain, director general of ESA. "We need to know much more about the Moon and Mars and how humans can use the resources in situ, not launch every kilo of stuff they will ever need. That's why in the meantime a lot of robotic missions to both the Moon and Mars are so very important."

Study reveals specific gene in adolescent men with delinquent peers

But family environment can tip the balance for better or worse

TALLAHASSEE, Fla. -- Birds of a feather flock together, according to the old adage, and adolescent males who possess a certain type of variation in a specific gene are more likely to flock to delinquent peers, according to a landmark study led by Florida State University criminologist Kevin M. Beaver.

"This research is groundbreaking because it shows that the propensity in some adolescents to affiliate with delinquent peers is tied up in the genome," said Beaver, an assistant professor in the FSU College of Criminology and Criminal Justice.

Criminological research has long linked antisocial, drug-using and criminal behavior to delinquent peers -- in fact, belonging to such a peer group is one of the strongest correlates to both youthful and adult crime. But the study led by Beaver is the first to establish a statistically significant association between an affinity for antisocial peer groups and a particular variation (called the 10-repeat allele) of the dopamine transporter gene (DAT1).

However, the study's analysis of family, peer and DNA data from 1,816 boys in middle and high school found that the association between DAT1 and delinquent peer affiliation applied primarily for those who had both the 10-repeat allele and a high-risk family environment (one marked by a disengaged mother and an absence of maternal affection).

In contrast, adolescent males with the very same gene variation who lived in low-risk families (those with high levels of maternal engagement and warmth) showed no statistically relevant affinity for antisocial friends.

"Our research has confirmed the importance of not only the genome but also the environment," Beaver said. "With a sample comprised of 1,816 individuals, more than usual for a genetic study, we were able to document a clear link between DAT1 and delinquent peers for adolescents raised in high-risk families while finding little or no such link in those from low-risk families. As a result, we now have genuine empirical evidence that the social and family environment in an adolescent's life can either exacerbate or blunt genetic effects."

Beaver and research colleagues John Paul Wright, an associate professor and senior research fellow at the University of Cincinnati, and Matt DeLisi, an associate professor of sociology at Iowa State University, have described their novel findings in the paper "Delinquent Peer Group Formation: Evidence of a Gene X Environment Correlation," which appears in the September 2008 issue of the *Journal of Genetic Psychology*.

The biosocial data analyzed by Beaver and his two co-authors derived from "Add Health," an ongoing project focused on adolescent health that is administered by the University of North Carolina-Chapel Hill and funded largely by the National Institute of Child Health and Human Development. Since the program began in 1994, a total of nearly 2,800 nationally representative male and female adolescents have been genotyped and interviewed.

"We can only hypothesize why we saw the effect of DAT1 only in male adolescents from high-risk families," said Beaver, who will continue his research into the close relationship between genotype and environmental factors -- a phenomenon known in the field of behavioral genetics as the "gene X environment correlation."

"Perhaps the 10-repeat allele is triggered by constant stress or the general lack of support, whereas in low-risk households, the variation might remain inactive," he said. "Or it's possible that the 10-repeat allele increases an adolescent boy's attraction to delinquent peers regardless of family type, but parents from low-risk families are simply better able to monitor and control such genetic tendencies."

Among female adolescents who carry the 10-repeat allele, Beaver and his colleagues found no statistically significant affinity for antisocial peers, regardless of whether the girls lived in a high-risk or low-risk family environment.

Too many calories send the brain off kilter

An overload of calories throws critical portions of the brain out of whack, reveals a study in the October 3rd issue of the journal *Cell*, a Cell Press publication. That response in the brain's hypothalamus—the "headquarters" for maintaining energy balance—can happen even in the absence of any weight gain, according to the new studies in mice.

The brain response involves a molecular player, called IKK β /NF- κ B, which is known to drive metabolic inflammation in other body tissues. The discovery suggests that treatments designed to block this pathway in the brain might fight the ever-increasing spread of obesity and related diseases, including diabetes and heart disease.

"This pathway is usually present but inactive in the brain," said Dongsheng Cai of the University of Wisconsin-Madison. Cai said he isn't sure exactly why IKK β /NF- κ B is there and ready to spring into action in the brain. He speculates it may have been an important element for innate immunity, the body's first line of defense against pathogenic invaders, at some time in the distant past.

"In today's society, this pathway is mobilized by a different environmental challenge—overnutrition," he said. Once activated, "the pathway leads to a number of dysfunctions, including resistance to insulin and leptin," both important metabolic hormones.

Earlier studies showed that overnutrition can spark inflammatory responses in the peripheral metabolic tissues, including the muscles and liver, and therefore cause various metabolic defects in those tissues that underlie type 2 diabetes. As a result, scientists identified IKK β as a target for an anti-inflammatory therapy that was effective against obesity-associated diabetes.

Yet whether metabolic inflammation and its mediators played a role in the central nervous system remained uncertain. Now, the researchers show that a chronic high-fat diet doubles the activity of this inflammatory pathway in the brains of mice. Its activity is also much higher in the brains of mice who are genetically predisposed to obesity, they found.

The researchers report that that increased activity of the IKK β /NF- κ B pathway can be divorced from obesity itself -- infusions of either glucose or fat into the brains of mice alone led to this inflammatory brain reaction.

Further studies revealed that this activity in the brain leads to insulin and leptin resistance. Insulin lowers blood sugar by causing cells of the body to take it up from the bloodstream. Leptin is a fat hormone important for appetite control.

Moreover, the researchers found that treatments preventing the activity of IKK β /NF- κ B in the animals' brains protected them from obesity.

While chronic inflammation is generally considered a consequence of obesity, the new results suggest the inflammatory reaction might also be a cause of the imbalance that leads to obesity and associated diseases, including diabetes. As Cai says, it appears that inflammation and obesity are "quite intertwined." An abundance of calories itself promotes inflammation, while obesity also feeds back to the neurons to further promote inflammation in a kind of vicious cycle.

The findings could lead to treatments that might stop this cycle before it gets started.

"Our work marks an initial attempt to study whether inhibiting an innate immune pathway in the hypothalamus could help to calibrate the set point of nutritional balance and therefore aid in counteracting energy imbalance and diseases induced by overnutrition," the researchers said. "We recognize that the significance of this strategy has yet to be realized in clinical practice; currently, most anti-inflammatory therapies have limited direct effects on IKK β /NF- κ B and limited capacity to be concentrated in the central nervous system. Nonetheless, our discoveries offer potential for treating these serious diseases."

If realized, such a strategy would likely offer a safe approach given that the critical pathway appears to be unnecessary in the hypothalamus under normal circumstances, they noted.

The researchers include Xiaoqing Zhang, University of Wisconsin-Madison, Madison, WI; Guo Zhang, University of Wisconsin-Madison, Madison, WI; Hai Zhang, University of Wisconsin-Madison, Madison, WI; Michael Karin, University of California, San Diego, La Jolla, CA; Hua Bai, University of Wisconsin-Madison, Madison, WI, and Dongsheng Cai, University of Wisconsin-Madison, Madison, WI.

Cross kingdom conflicts on a beetle's back

BOSTON, Mass. (Oct. 2, 2008)—Researchers from Harvard Medical School and the University of Madison-Wisconsin have discovered how beetles and bacteria form a symbiotic and mutualistic relationship—one that ultimately results in the destruction of pine forests. In addition, they've identified the specific molecule that drives this whole phenomenon.

The context of this discovery can easily be imagined as a story arc that includes some of the most unlikely characters and props.

Setting: The interior of a pine tree.

Enter the protagonist: The pine beetle, boring its way through the bark, a five millimeter arthropod ready to go into labor and lay a few hundred eggs. Tucked in a specialized storage compartment in its shell, the beetle has a ready supply of spores for *Entomocorticium*, a nourishing fungal baby food for the beetle's gestating larvae.

Enter the antagonist: The mite, a microscopic interloper that secretly hitched a ride on the beetle.

Conflict: Unbeknownst to mother pine beetle, the mite has snuck in a supply of *Ophiostoma minus*, a pathogenic fungi that can wipe out the entire supply of fungal larvae food. The mite releases this toxin.

Climax: Will the baby beetles die of starvation?

Resolution: Catching the mite off guard—as well as the scientists conducting the study!—the mother beetle is ready with actinomycetes, a bacteria that neutralizes the toxic fungi by means of a tiny fatty acid.

Conclusion: While actinomycetes rescues the baby beetles from certain starvation, the larvae-friendly *Entomocorticium* softens up the pine, allowing the fledgling beetles to eat not only the fungi but the tree itself. Soon, the young beetles leave to begin their new lives. Mother beetle gathers up the remaining supply of *Entomocorticium* and heads for another tree. The beetles live, and the infernal mite is thwarted.

Surprise ending: The camera pans back, and we quickly realize that the beetles' success has cost the tree its life. An aerial view reveals miles and miles of dead pine forest, and, as the ominous audio track implies, scores of pine beetles will continue moving from tree to tree leaving ravished forests in their wake.

"So you have a beetle, a mite, a tree, two kinds of fungi, and a bacterium," says Jon Clardy, Harvard Medical School professor of biological chemistry and molecular pharmacology who, along with Cameron Currie from the University of Madison-Wisconsin, is co-senior author on the study. "Discovering this particular bacterium, and the active molecule, has added the molecular dimension to this chemical ecology of this complex multi-lateral system. It highlights the importance of bacteria in ways that people don't really even think about."

The findings will be published in the October 3 issue of *Science*.

The ground work for this study began in 1999 when Currie published a paper demonstrating how leafcutter ants mediate their fungal environment through bacteria. Suspecting that this phenomenon may be common throughout the animal kingdom, Currie teamed up with Clardy to examine the pine beetle.

Pine beetles are like little landscape engineers, drilling through the bark and into pine trees, using fungus to create an environment in which to lay their eggs. As a result of this activity, thousands of miles of trees are destroyed each year, often resulting in widespread forest fires. Regions such as western Canada are particularly affected by this.

Experts have known that just like the fungus-growing ants, pine beetles also use fungus to feed their larvae, and that they often managed to avoid the adverse affects of pathogenic fungi often present in the tree. But the precise means by which they interact with fungal microbes has never been demonstrated.

Currie and research assistant Jarrod Scott discovered that the beetle carries a bacteria in a specialized compartment, and after a series of experiments found that the bacteria produced an antifungal agent that killed the pathogenic fungi snuck in by the trespassing mite.

In order to delve deeper into how the bacteria works, Dong-Chan Oh, a postdoctoral researcher in Clardy's Harvard Medical School lab, used a variety of laboratory tools, such as nuclear magnetic resonance techniques and chromatography, to both locate the molecule and identify its structure. The molecule turns out to be a kind of fatty acid.

"It's becoming clear that symbiotic relationships between plants, animals, and microbes are essential for the diversification of life and evolution of organisms," says Currie. "This is an example of a system where we have insights into the importance of the diversity of microbes. We believe that this type of mutualism is widespread."

In addition, the researchers suspect that this association represents a source of small molecules that can be used in medicine.

"This molecule is nature's anti-fungal," says Clardy, "and it looks like there are a lot of them."

This is particularly significant, since pathogenic fungal infections in people are a major health concern. These infections are often fatal, and at the moment, no reliable medications for them exist. Here, however, we have an example of an antibiotic successfully disabling a powerful fungi.

"This particular molecule is too unstable to be a viable candidate," says Clardy. "Still, we need to study how it kills fungi, learn the mechanisms. We can look into other bacterial genomes and investigate other anti-fungal processes."

Suspecting that this symbiotic dynamic is far more the rule than the exception, Clardy and Currie are investigating other insect species as well to see how universal this "story arc" is.

This research was funded by the U.S. Department of Agriculture, National Institutes of Health, and the National Science Foundation. The funding and data sources for this study had no role in study design; in the collection, analysis, and interpretation of data; or in the writing of the report.

Written by David Cameron

FINDINGS

There's far more to a pine beetle's back than a hard black shell. Researchers have found that these tiny creatures—responsible for rampant and widespread forest destruction—carry on their backs battling species of fungi, plus a powerful antibiotic molecule that can destroy pathogenic fungi—something that no current medications have achieved.

RELEVANCE

Currently, pathogenic fungal infections are a significant clinical challenge. These findings suggest a potential new source of pharmaceuticals for that purpose. In addition, this study shows how the symbiotic relationships between plants, animals, and microbes are essential for the diversification of life and evolution of organisms.

PRINCIPAL INVESTIGATORS

John Clardy, Professor of biological chemistry and molecular pharmacology, Harvard Medical School

http://bcmp.med.harvard.edu/index.php?option=com_akostaff&Itemid=51&func=fullview&staffid=19

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<http://www.bact.wisc.edu/faculty/currie/>

***MULTI-MEDIA** Slideshow: <http://hms.harvard.edu/public/news/jc2008/slideshow.html>*

JOURNAL Science

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"Bacterial Protection of Beetle-Fungus Mutualism"

Jarrold J. Scott(1), Dong-Chan Oh(2*), M. Cetin Yuceer(3*), Kier D. Klepzig(4), Jon Clardy(2†), Cameron R. Currie(1†)*

Researchers reveal Epstein-Barr virus protein contributes to cancer

Researchers at the University of Toronto have shown that the EBNA1 protein of Epstein-Barr virus (EBV) disrupts structures in the nucleus of nasopharyngeal carcinoma (NPC) cells, thereby interfering with cellular processes that normally prevent cancer development. The study, published October 3rd in the open-access journal PLoS Pathogens, describes a novel mechanism by which viral proteins contribute to carcinogenesis.

EBV is a common herpesvirus whose latent infection is strongly associated with several types of cancer including NPC, a tumor that is endemic in several parts of the world. With NPC only a few EBV proteins are expressed, including EBNA1. EBNA1 is required for the persistence of the EBV genomes, however, whether or not EBNA1 directly contributes to the development of tumors has not been clear, until now.

In this study Frappier and her team examined PML nuclear bodies and proteins in EBV-positive and EBV-negative NPC cells. Manipulation of EBNA1 levels in each cell type clearly showed that EBNA1 expression induces the loss of PML proteins and PML nuclear bodies through an association of EBNA1 with the PML bodies. PML nuclear bodies are known to have tumor-suppressive effects due to their roles in regulating DNA repair and programmed cell death, and accordingly, EBNA1 was shown to interfere with these processes.

The researchers conclude that there is "an important role for EBNA1 in the development of NPC, in which EBNA1-mediated disruption of PML nuclear bodies promotes the survival of cells with DNA damage." Since EBNA1 is expressed in all EBV-associated tumors, including B-cell lymphomas and gastric carcinoma, these findings raise the possibility that EBNA1 could play a similar role in the development of these cancers. The cellular effects of EBNA1 in other EBV-induced cancers will require further investigation.

<http://www.plospathogens.org/doi/ppat.1000170> (link will go live on Friday, October 3)

***CITATION:** Sivachandran N, Sarkari F, Frappier L (2008) Epstein-Barr Nuclear Antigen 1 Contributes to Nasopharyngeal Carcinoma through Disruption of PML Nuclear Bodies. *PLoS Pathog* 4(10): e1000170. doi:10.1371/journal.ppat.1000170*

Sharpening up Jupiter

New image-correction technique delivers sharpest whole-planet ground-based picture ever

Amazing image of Jupiter taken in infrared light on the night of Aug. 17, 2008, with the Multi-Conjugate

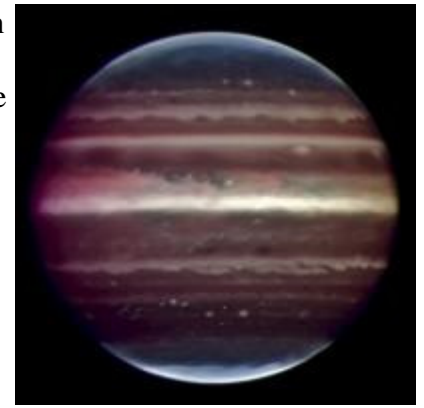
A record two-hour observation of Jupiter using a superior technique to remove atmospheric blur has produced the sharpest whole-planet picture ever taken from the ground. The series of 265 snapshots obtained with the Multi-Conjugate Adaptive Optics Demonstrator (MAD) prototype instrument mounted on ESO's Very Large Telescope (VLT) reveal changes in Jupiter's smog-like haze, probably in response to a planet-wide upheaval more than a year ago.

Being able to correct wide field images for atmospheric distortions has been the dream of scientists and engineers for decades. The new images of Jupiter prove the value of the advanced technology used by MAD, which uses two or more guide stars instead of one as references to remove the blur caused by atmospheric turbulence over a field of view thirty times larger than existing techniques [1].

"This type of adaptive optics has a big advantage for looking at large objects, such as planets, star clusters or nebulae," says lead researcher Franck Marchis, from UC Berkeley and the SETI Institute in Mountain View,

California, USA. "While regular adaptive optics provides excellent correction in a small field of view, MAD provides good correction over a larger area of sky. And in fact, were it not for MAD, we would not have been able to perform these amazing observations."

MAD allowed the researchers to observe Jupiter for almost two hours on 16 and 17 August 2008, a record duration, according to the observing team. Conventional adaptive optics systems using a single Jupiter moon as reference cannot monitor Jupiter for so long because the moon moves too far from the planet. The Hubble Space Telescope cannot observe Jupiter continuously for more than about 50 minutes, because its view is regularly blocked by the Earth during Hubble's 96-minute orbit.



Amazing image of Jupiter taken in infrared light on the night of Aug. 17, 2008, with the Multi-Conjugate Adaptive Optics Demonstrator prototype instrument mounted on ESO's Very Large Telescope. This false colour photo is the combination of a series of images taken over a time span of about 20 minutes, through three different filters (2, 2.14, and 2.16 microns). The image sharpening obtained is about 90 milli-arcseconds across the whole planetary disc, a real record on similar images taken from the ground. This corresponds to seeing details about 300 km wide on the surface of the giant planet. The great red spot is not visible in this image as it was on the other side of the planet during the observations. The observations were done at infrared wavelengths where absorption due to hydrogen and methane is strong. This explains why the colours are different from how we usually see Jupiter in visible-light. This absorption means that light can be reflected back only from high-altitude hazes, and not from deeper clouds. These hazes lie in the very stable upper part of Jupiter's troposphere, where pressures are between 0.15 and 0.3 bar. Mixing is weak within this stable region, so tiny haze particles can survive for days to years, depending on their size and fall speed. Additionally, near the planet's poles, a higher stratospheric haze (light blue regions) is generated by interactions with particles trapped in Jupiter's intense magnetic field. ESO/F. Marchis, M. Wong, E. Marchetti, P. Amico, S. Tordo

Using MAD, ESO astronomer Paola Amico, MAD project manager Enrico Marchetti and Sébastien Tordo from the MAD team tracked two of Jupiter's largest moons, Europa and Io – one on each side of the planet – to provide a good correction across the full disc of the planet. "It was the most challenging observation we performed with MAD, because we had to track with high accuracy two moons moving at different speeds, while simultaneously chasing Jupiter," says Marchetti.

With this unique series of images, the team found a major alteration in the brightness of the equatorial haze, which lies in a 16 000-kilometre wide belt over Jupiter's equator [2]. More sunlight reflecting off upper atmospheric haze means that the amount of haze has increased, or that it has moved up to higher altitudes. "The brightest portion had shifted south by more than 6000 kilometres," explains team member Mike Wong.

This conclusion came after comparison with images taken in 2005 by Wong and colleague Imke de Pater using the Hubble Space Telescope. The Hubble images, taken at infrared wavelengths very close to those used for the VLT study, show more haze in the northern half of the bright Equatorial Zone, while the 2008 VLT images show a clear shift to the south.

"The change we see in the haze could be related to big changes in cloud patterns associated with last year's planet-wide upheaval, but we need to look at more data to narrow down precisely when the changes occurred," declares Wong.

A taste for scorpion venom could be cancer's undoing

RADIOACTIVE scorpion venom sounds like the ultimate doomsday weapon but it is now being tested as a treatment for malignant brain cancer.

The scorpion *Leiurus quinquestriatus* lives in the Middle East. Among the powerful cocktail of neurotoxins packed into its venom is a peptide that is non-toxic to humans and binds to a receptor found only on some tumour cells. In culture, the peptide has invaded tumours in breast, skin, brain and lung tissue, but left healthy cells untouched. "It's as if the tumours collect it," says Michael Egan of the company TransMolecular in Cambridge, Massachusetts. To see if the peptide could deliver lethal doses of radioactivity to cancer cells, researchers at the company have attached radioactive iodine isotopes to it.

In a trial last year, they injected this agent directly into the tumours of 59 people suffering from inoperable brain cancer. All the patients have now died, but those receiving a higher dose lived for three months longer, on average.

In recent weeks, researchers at the University of Chicago in Illinois have begun injecting TM601 into the bloodstream of people with different types of malignant brain cancer. This latest trial will allow the company to test whether TM601 can seek out and kill secondary tumours throughout the body, as well as known primary ones.

Liver transplant recipients almost 3 times more likely to develop cancer

Cancer incidence is higher among liver transplant recipients in Finland compared to the general population, according to a new study in the October issue of *Liver Transplantation*, a journal by John Wiley & Sons. The article is also available online at Wiley Interscience (www.interscience.wiley.com).

Transplantation, and subsequent immunosuppression which keeps rejection at bay, have long been associated with increased cancer risk. Several studies have examined the issue, but few have used a control population for comparison, and many rely on limited data. More studies are needed to reliably reveal the cancer risk pattern after transplantation, so doctors can optimize immunosuppression, cancer surveillance and risk management.

Researchers, led by Helena Isoniemi of Finland, sought to describe the cancer risk pattern in Finnish liver transplant patients, hypothesizing that the incidence of specific types of cancer would be higher among the recipients. They included all liver transplant patients from Helsinki University Central Hospital transplanted between 1982 and 2005. Using the Finnish Population Register and the national Cancer Registry, they were able to follow-up on each patient beginning at the date of transplant through the end of 2005.

Among the 540 liver transplant recipients, they found a total of 39 post-transplant de novo cancers in 36 patients. The overall standardized incidence ratio (SIR) compared to the general population was 2.59. Non-Hodgkin lymphoma, non-melanoma skin cancer and basal cell carcinoma had significantly elevated SIRs.

"The most common cancer types in our cohort were lymphoma and skin cancer," the authors report. "Non-Hodgkin lymphoma, which included four cases of post-transplant lymphoproliferative disorder, occurred more frequently in males, in patients transplanted at a younger age and soon after transplantation." By contrast, non-melanoma skin cancer was more common among older patients and those who had antibody induction therapy. Interestingly, the authors found lower cancer incidence among patients with history of acute rejections, correlating most strongly with lymphomas.

"Based on our data, one out of six liver transplant patients is estimated to develop some form of cancer by 20 years after transplantation." The authors report. "This study points out the importance of cancer surveillance after liver transplantation."

An accompanying editorial by Ashokkumar Jain of the University of Rochester et. al. reviews the Aberg et al findings alongside the rest of the literature, looking closely at patient age and duration of follow-up. Aberg and colleagues "show that the cumulative incidence of de novo cancers increased at 1, 5, 10 and 20 years of follow up from 3 percent, 5 percent, 13 percent and 16 percent respectively," Jain writes.

He also pointed out that other reports have noted a significantly increased risk of de novo oropharyngeal and lung cancers amongst liver transplant patients that smoke, which is a potentially preventable condition.

Throughout the literature, Jain and his coauthors found wide variation in the reported incidence of post transplant cancers, partly related to the length of follow up and partly related to the inclusion or exclusion of lymphoid lesions.

"The overall rate of de novo solid tumors increased with age at the time of transplant and the length of follow up; while the rate of post-transplant lympho-proliferative disorders decreased with age at the liver transplant, with a higher incidence in the first few years," they conclude.

Rethinking Who Should Be Considered 'Essential' During a Pandemic Flu Outbreak

Not only are doctors, nurses, and firefighters essential during a severe pandemic influenza outbreak. So, too, are truck drivers, communications personnel, and utility workers. That's the conclusion of a Johns Hopkins University article to be published in the journal of *Biosecurity and Bioterrorism*. The report, led by Nancy Kass, Sc.D, Deputy Director of Public Health for the Johns Hopkins Berman Institute of Bioethics, provides ethical guidance for pandemic planning that ensures a skeletal infrastructure remain intact at all times. Dr. Kass says, "when preparing for a severe pandemic flu it is crucial for leaders to recognize that if the public has limited or no access to food, water, sewage systems, fuel and communications, the secondary consequences may cause greater sickness death and social breakdown than the virus itself."

The authors represent a wide-range of expertise in several areas of pandemic emergency planning both at the state and federal levels. After examining several accepted public health rationing strategies that give priority to all healthcare workers and those most susceptible to illness, the authors propose a new strategy that gives priority to a more diverse group. "Alongside healthcare workers and first responders, priority should be given to the people who provide the public with basic essentials for good health and well-being, ranging from grocery store employees and communications personnel to truck drivers and utility workers," says Dr. Kass.

The report recognizes that given the widespread and sustained nature of a pandemic, federal assistance will be spread thin and local jurisdictions must develop their own preparedness plans to ensure they are capable of sustained self-sufficiency. Encouraging and working with local businesses to develop their own response plans can help reduce the burden on local governments during a pandemic. Similarly, individuals and families who

can afford it should do their best to prepare for any disaster. The paper notes, the more initiative the general public exercises in stockpiling several weeks' worth of food, water, paper goods, batteries medicines, and other needed supplies, the less vulnerable they will be to a break in the supply chain. In fact, the report emphasizes, it is important for leaders to communicate to the middle class and the wealthy that it is their responsibility to prepare for self-sufficiency in order to free up scarce supplies and allow first responders to direct their attention towards those too poor or vulnerable to prepare themselves.

The article lays out a set of ethics rules and principles to help guide and frame a pandemic response strategy that is evidence-based, transparent, fair, and recognizes the burdens the public may face. Dr. Kass points out the "consideration of ethics are critical not only in having respectful and inclusive discussion and engaging with the public fairly, but it also improves the likelihood of public health and medical success through increased cooperation and understanding of government plans."

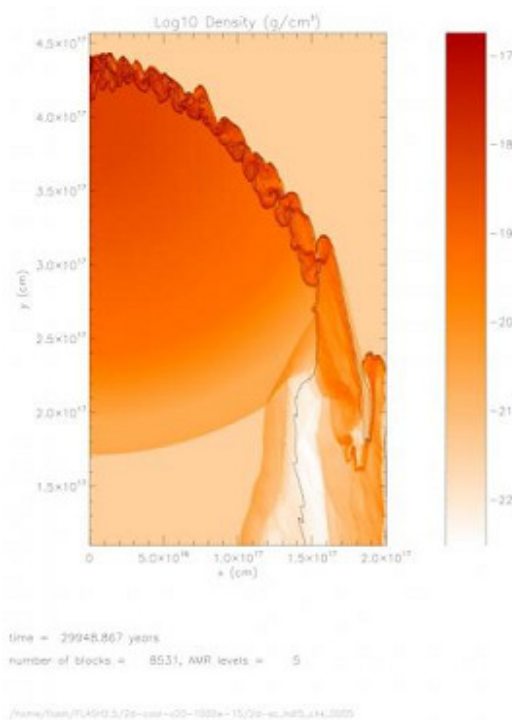
Other authors of this paper include: Jean Otto, DrPH, Senior Epidemiologist, Department of Defense, Global Emerging Infections Surveillance and Response System, Armed Forces Health Surveillance Center, Walter Reed Army Institute of Research; Daniel O'Brien, JD, Principal Counsel, Office of the Maryland Attorney General, Department of Health and Mental Hygiene; and Mathew Minson, MD, Senior Medical Officer for Strategic Initiatives, Office of the Assistant Secretary for Preparedness and Response, U.S. Department of Health and Human Services.

'Little bang' triggered solar system formation

Washington, D.C.—For several decades, scientists have thought that the Solar System formed as a result of a shock wave from an exploding star—a supernova—that triggered the collapse of a dense, dusty gas cloud that contracted to form the Sun and the planets. But detailed models of this formation process have only worked under the simplifying assumption that the temperatures during the violent events remained constant. Now, astrophysicists at the Carnegie Institution's Department of Terrestrial Magnetism (DTM) have shown for the first time that a supernova could indeed have triggered the Solar System's formation under the more likely conditions of rapid heating and cooling. The results, published in the October 20, 2008, issue of the *Astrophysical Journal*, have resolved this long-standing debate.

"We've had chemical evidence from meteorites that points to a supernova triggering our Solar System's formation since the 1970s," remarked lead author, Carnegie's Alan Boss. "But the devil has been in the details. Until this study, scientists have not been able to work out a self-consistent scenario, where collapse is triggered at the same time that newly created isotopes from the supernova are injected into the collapsing cloud."

Short-lived radioactive isotopes—versions of elements with the same number of protons, but a different number of neutrons—found in very old meteorites decay on time scales of millions of years and turn into different (so-called daughter) elements. Finding the daughter elements in primitive meteorites implies that the parent short-lived radioisotopes must have been created only a million or so years before the meteorites themselves were formed. "One of these parent isotopes, iron-60, can be made in significant amounts only in the potent nuclear furnaces of massive or evolved stars," explained Boss. "Iron-60 decays into nickel-60, and nickel-60 has been found in primitive meteorites. So we've known where and when the parent isotope was made, but not how it got here."



Cross-sectional view of one-half of a solar-mass target cloud being struck by a supernova shock front that is traveling downward. The colors represent the target cloud, with redder colors representing denser regions. The solid black contours delineate material that was originally in the supernova shock front, where short-lived radioisotopes are being injected into the collapsing target cloud.

Previous models by Boss and former DTM Fellow Prudence Foster showed that the isotopes could be deposited into a pre-solar cloud if a shock wave from a supernova explosion slowed to 6 to 25 miles per second and the wave and cloud had a constant temperature of -440 °F (10 K). "Those models didn't work if the material was heated by compression and cooled by radiation, and this conundrum has left serious doubts in the community about whether a supernova shock started these events over four billion years ago or not," remarked Harri Vanhala, who found the negative result in his Ph.D. thesis work at the Harvard-Smithsonian Center for Astrophysics in 1997.

Using an adaptive mesh refinement hydrodynamics code, FLASH2.5, designed to handle shock fronts, as well as an improved cooling law, the Carnegie researchers considered several different situations. In all of the models, the shock front struck a pre-solar cloud with the mass of our Sun, consisting of dust, water, carbon

monoxide, and molecular hydrogen, reaching temperatures as high as 1,340°F (1000 K). In the absence of cooling, the cloud could not collapse. However, with the new cooling law, they found that after 100,000 years the pre-solar cloud was 1,000 times denser than before, and that heat from the shock front was rapidly lost, resulting in only a thin layer with temperatures close to 1,340°F (1000 K). After 160,000 years, the cloud center had collapsed to become a million times denser, forming the protosun. The researchers found that isotopes from the shock front were mixed into the protosun in a manner consistent with their origin in a supernova.

"This is the first time a detailed model for a supernova triggering the formation of our solar system has been shown to work," said Boss. "We started with a Little Bang 9 billion years after the Big Bang."

This research was supported in part by the NASA Origins of Solar Systems and Planetary Geology and Geophysics Programs and in part by the NASA Astrobiology Institute. The software used in this work was in part developed by the DOE-supported ASC/Alliances Center for Astrophysical Thermonuclear Flashes at the University of Chicago.

Second lumpectomy for breast cancer reduces survival rates

UC Davis researchers find disturbing trend in treating recurrent breast cancer

SACRAMENTO, Calif. - A majority of women with breast cancer today are candidates for lumpectomy, allowing for conservation of most of their breast tissue. Results of a UC Davis study, however, show that a number of women whose cancer recurs in the same breast are treated with a second lumpectomy rather than a mastectomy, defying current treatment recommendations and cutting the number of years those women survive in half.

"We were surprised to find that so many women in our study — almost a quarter of them — had received another lumpectomy rather than a mastectomy," said Steven Chen, a UC Davis Cancer Center surgical oncologist and lead author of the study, which appears in the October issue of the American Journal of Surgery. "It's likely that patients are asking for lumpectomies when their cancer is diagnosed a second time, and their doctors are simply complying with that request. Whatever the reason, that decision can shorten life spans."

Chen and study co-author, Steve Martinez, also a UC Davis Cancer Center surgical oncologist, gathered data from the National Cancer Institute's Surveillance, Epidemiology and End Results database, which includes information on all cancers diagnosed in selected regions throughout the nation. Their study included 747 patients who previously received breast-conservation therapy and were diagnosed with cancer a second time in the same breast between 1988 and 2004.

The authors found that women who had mastectomies had a 78 percent survival rate after five years, while those who had second lumpectomies had a 67 percent survival rate. The 10-year survival rates were 62 percent for those who had mastectomies and 57 percent for those who had second lumpectomies. In all, 24 percent of women with recurrent breast cancer in the same breast had second lumpectomies.

The researchers went on to calculate the risk of dying for mastectomy patients compared to lumpectomy patients. They found that, after adjusting for factors that affect survival, there will be half as many survivors at any given time in the lumpectomy group versus the mastectomy group.

Chen explained that a mastectomy is the generally accepted surgical treatment for a second cancer because whole breast radiation, which typically accompanies a lumpectomy, is not usually recommended twice in a lifetime. This new study shows as well that there is a survival advantage to those who choose a mastectomy.

According to Martinez, knowledge of breast cancer and its treatments are continuously advancing, and second lumpectomies could at some point become a viable option.

"As therapy for breast cancer becomes more targeted and researchers come closer to identifying those factors that make some breast cancers more aggressive than others, we may have the option of recommending second and even third lumpectomies in select cases in the future. Until then, mastectomy remains the best option for women experiencing a same-breast recurrence of their breast cancer," he said.

Breast cancer is currently the most common newly diagnosed malignancy among American women. The chance of developing invasive breast cancer at some time in a woman's life is about 1 in 8. In the United States in 2008, an estimated 182,460 new cases of invasive breast cancer will be diagnosed, an additional 67,770 new cases of carcinoma in situ — or "pre-cancer" — will be discovered and 40,480 women will die from breast cancer.

Musicians use both sides of their brains more frequently than average people

NASHVILLE, Tenn.--Supporting what many of us who are not musically talented have often felt, new research reveals that trained musicians really do think differently than the rest of us. Vanderbilt University psychologists have found that professionally trained musicians more effectively use a creative technique called divergent thinking, and also use both the left and the right sides of their frontal cortex more heavily than the average person.

The research by Crystal Gibson, Bradley Folley and Sohee Park is currently in press at the journal Brain and Cognition.

"We were interested in how individuals who are naturally creative look at problems that are best solved by thinking 'out of the box'," Folley said. "We studied musicians because creative thinking is part of their daily experience, and we found that there were qualitative differences in the types of answers they gave to problems and in their associated brain activity."

One possible explanation the researchers offer for the musicians' elevated use of both brain hemispheres is that many musicians must be able to use both hands independently to play their instruments.

"Musicians may be particularly good at efficiently accessing and integrating competing information from both hemispheres," Folley said. "Instrumental musicians often integrate different melodic lines with both hands into a single musical piece, and they have to be very good at simultaneously reading the musical symbols, which are like left-hemisphere-based language, and integrating the written music with their own interpretation, which has been linked to the right hemisphere."

Previous studies of creativity have focused on divergent thinking, which is the ability to come up with new solutions to open-ended, multifaceted problems. Highly creative individuals often display more divergent thinking than their less creative counterparts.

To conduct the study, the researchers recruited 20 classical music students from the Vanderbilt Blair School of Music and 20 non-musicians from a Vanderbilt introductory psychology course. The musicians each had at least eight years of training. The instruments they played included the piano, woodwind, string and percussion instruments. The groups were matched based on age, gender, education, sex, high school grades and SAT scores.

The researchers conducted two experiments to compare the creative thinking processes of the musicians and the control subjects. In the first experiment, the researchers showed the research subjects a variety of household objects and asked them to make up new functions for them, and also gave them a written word association test. The musicians gave more correct responses than non-musicians on the word association test, which the researchers believe may be attributed to enhanced verbal ability among musicians. The musicians also suggested more novel uses for the household objects than their non-musical counterparts.

In the second experiment, the two groups again were asked to identify new uses for everyday objects as well as to perform a basic control task while the activity in their prefrontal lobes was monitored using a brain scanning technique called near-infrared spectroscopy, or NIRS. NIRS measures changes in blood oxygenation in the cortex while an individual is performing a cognitive task.

"When we measured subjects' prefrontal cortical activity while completing the alternate uses task, we found that trained musicians had greater activity in both sides of their frontal lobes. Because we equated musicians and non-musicians in terms of their performance, this finding was not simply due to the musicians inventing more uses; there seems to be a qualitative difference in how they think about this information," Folley said.

The researchers also found that, overall, the musicians had higher IQ scores than the non-musicians, supporting recent studies that intensive musical training is associated with an elevated IQ score.

The research was partially supported by a Vanderbilt University Discovery Grant.

Why your boss is white, middle-class and a show-off

The way male managers power dress, posture and exercise power is due to humans' evolutionary biology, according to research from the University of New South Wales (UNSW).

Prehistoric behaviours, such as male domination, protecting what is perceived as their "turf" and ostracising those who do not agree with the group is more commonplace in everyday work situations than many of us want to accept, according to the research which was carried out in hospitals.

"This tribal culture is similar to what we would have seen in hunter gather bands on the savannah in southern Africa," says the author of the paper, Professor Jeffrey Braithwaite, from UNSW's Institute for Health Innovation.

"While this research focuses specifically on health care settings, the results can be extrapolated to other workplaces," says Professor Braithwaite.

"Groups were territorial in the past because it helped them survive. If you weren't in a tight band, you didn't get to pass on your genes," he says. "Such tribalism is not necessary in the same way now, yet we still have those characteristics because they have evolved over two million years.

"It's a surprise just how hard-wired this behaviour is," says Professor Braithwaite. "It's predictable that a group will ostracise a whistleblower, for instance. It's not good, but it's understandable in the tribal framework. It explains all sorts of undesirable behaviours, including bullying."

Professor Braithwaite's research is based on hundreds of interviews and observations of health workers over a 15-year period. He used an evolutionary psychology approach – incorporating archaeology and anthropology of the earliest known humans – to compare with modern behaviours.

It is hoped the research can be used to develop strategies to encourage clinical professionals to work together more effectively.

"We need to stop being simplistic and realise that changing behaviours and encouraging teamwork is much harder than we think," says Professor Braithwaite. "Getting different groups together and talking through some of the differences, and appreciating some of the unwritten rules which drive people, are crucial steps in improving trust.

"We also need to re-think education. We train doctors in a completely different arena from nurses and allied health staff, then we bring them together in the workplace after they graduate and expect everyone to be team players," he says. "We need to bring them together much earlier in the educational process."

Other features include:

- * Meetings are held in the most senior manager's office, who typically dominates proceedings
- * Managers do not spend as much of their time as people think sitting reading quietly, or attending to paperwork in front of a computer. They are out there manoeuvring and positioning at meetings, one-on-one encounters and coffee cliques.
- * Managers rarely take lunch or tea breaks
- * Non-managerial staff regularly take an allocated period of time for breaks

The paper has just been published in the Journal of Health Organisation and Management.

'Coca-Cola douches' scoop Ig Nobel prize

* 00:30 03 October 2008

* NewScientist.com news service

* **Jeff Hecht**

Tests of whether sodas such as Coke and Pepsi could be used as spermicides were among the many offbeat ideas celebrated at the 2008 Ig Nobel awards on Thursday. Lap dancers' tips and armadillos' uncanny ability to wreak havoc at archaeological sites were also the subjects of prize-winning studies.

The tongue-in-cheek awards, presented at Harvard University, are organised by the humorous scientific journal the Annals of Improbable Research for research achievements "that make people laugh – then think".

Deborah Anderson of Harvard Medical School's birth-control laboratory took her first step towards the Ig Nobel chemistry prize in the 1980s when she asked medical student Sharee Umpierre what type of contraception had been used at the all-girl Catholic boarding school she had attended in Puerto Rico.

"Coca-Cola douches," Umpierre replied. Though that was the first Anderson had heard of the idea, her gynaecologist colleague, Joe Hill, remembered a song of the same name by an outrageous 1960s band called The Fugs.

"Coca-Cola douches had become a part of contraceptive folklore during the 1950s and 1960s, when other birth-control methods were hard to come by," Anderson told New Scientist. "It was believed that the carbonic acid in Coke killed sperm, and the method came with its own 'shake and shoot applicator'" – the classic Coke bottle.

Swimming sperm

To see if Coke really worked, Anderson, Umpierre and Hill mixed four different types of Coke with sperm in test tubes. A minute later, all sperm were dead in the Diet Coke, but 41% were still swimming in the just-introduced New Coke (The New England Journal of Medicine, vol 313, p 1351).

But that's not good enough, Anderson warns. Sperm "can make it into the cervical canal, out of reach of any douching solution, in seconds" – faster than anyone could shake and apply a bottle of Diet Coke.

The three researchers shared the chemistry prize with Chuang-Ye Hong of the Taipei Medical University in Taiwan and his colleagues, whose similar experiment found both Coca-Cola and its arch-rival Pepsi-Cola useless as spermicides (Human Toxicology, vol 6, p 395).

Costly cure

Another experiment with huge implications for health policy garnered the Ig Nobel medicine prize for Dan Ariely of Duke University in North Carolina.

While at the Massachusetts Institute of Technology, he gave two groups of volunteers identical placebos masquerading as painkillers, telling one group the pills cost \$2.50 each and the other that the pills had been discounted to 10 cents each.

The volunteers didn't pay for the pills, but those who took the "more costly" fake medicine felt less pain from electric shocks than those who took the cheap fakes (Journal of the American Medical Association, vol 299, p 1016). Price affects people's expectations and thus their response to medicine, Ariely says – the more expensive the pill, the more relief they expect.

Fertility offering

One Ig Nobel-winning experiment probing human nature has been featured in *New Scientist*: can women somehow signal when they are at their peak fertility? Most other female mammals do so openly, but men don't consciously recognise any such signal from women.

To investigate, University of New Mexico psychologists Geoffrey Miller, Joshua Tybur and Brent Jordan asked women working as lap dancers to report their nightly tips, and whether they were on hormonal contraceptives or menstruating naturally.

The two groups of women received similar tips when they were in non-fertile parts of their cycle, but when the naturally menstruating women reached their fertile days they earned significantly more (*Evolution and Human Behavior*, vol 28, p 375).

Armadillo archaeologists

No tips were offered to the burrowing animals on archaeological sites studied by the two Brazilians who earned the archaeology prize. Serious archaeologists don't follow the Indiana Jones approach of grabbing stuff and running. They meticulously extract artefacts from the ground, noting their precise location in order to deduce their age and function. Unfortunately, local wildlife is not so careful.

To assess the damage done by burrowers, Astolfo Araújo of the University of São Paulo and José Marcelino of São Paulo's Department of Historical Heritage spray-painted potsherds and rocks four different colours and carefully buried them in separate layers of a test site. Then they turned an armadillo loose in the little patch of dirt for a couple of months. Sure enough, the armadillo jumbled up the fragments (*Geoarchaeology*, vol 18, p. 433).

Finally, recognising the achievements of ethics departments everywhere, the Ig Nobel peace prize went to the Swiss Federal Ethics Committee on Non-Human Biology "for adopting the principle that plants have dignity". In a document titled "The dignity of living beings with regard to plants", the committee concludes that causing "arbitrary harm" to plants is "morally impermissible". Home owners everywhere can thank the committee for the excuse to stop mowing the lawn and weeding the garden.

Ig Nobel Prize is 'knot funny'

We all know it and science has proved it - wires, string, and hair will inevitably tie themselves in knots. This astonishing non-revelation is one of 10 pieces of real research honoured this year with Ig Nobel Prizes. The spoof alternatives to the rather more sober Nobel prizes were presented in a ceremony at Harvard University.

Other winners included studies that showed coca cola was an effective spermicide; and that fleas on dogs jump higher than fleas on cats.

The much-coveted spoof prizes are said to reward scientific achievements which "cannot, or should not, be reproduced"; achievements that "first make people laugh, and then make them think". They are run by the science humour magazine *Annals of Improbable Research*.

Seven of the 10 winners this year paid their own way to receive their prizes at the famous US university.

All joined in the fun. Three Japanese scientists sang their acceptance speech for the award which honoured their research showing that slime moulds (amoeba-like organisms) can find their way through mazes.

Like the other winners, their study was genuine research published in a scientific journal - in their case, the prestigious journal *Nature*.

Charles Spence, from Oxford University, UK, walked away with the Nutrition Prize for showing how the way foods taste is affected by how they sound.

"When you play the sound of crisps when people bite into Pringles - if we change the sound as they eat, we can actually change how fresh, or how crisp, the Pringle tastes to people," he told BBC News.

"We've used [a bacon sizzling] sound to flip the flavour of bacon and egg ice cream. If we play that sound over the loudspeakers in the room, the ice cream will taste more 'bacony' than if you play the sound of, say, farmyard chickens."

The ceremony began with past Ig winner Dan Meyer - the co-author of a *British Medical Journal* study on Sword-swallowing and Its Side Effects - swallowing a sword.

Marc Abrahams, master of ceremonies and editor of the *Annals of Improbable Research*, closed the event with the traditional words: "If you didn't win an Ig Nobel Prize tonight - and especially if you did - better luck next year."

The full list of winners:

Nutrition: Massimiliano Zampini and Charles Spence for their study showing that food actually tastes better if it sounds crunchier.

Peace: The Swiss Federal Ethics Committee on Non-Human Biotechnology and the citizens of Switzerland for adopting the legal principle that plants have dignity.

Archaeology: Astolfo Gomes de Mello Araujo and Jose Carlos Marcelino for demonstrating that armadillos can turn the contents of an archaeological dig upside down.

Biology: Marie-Christine Cadiergues, Christel Joubert and Michel Franc for showing that fleas on dogs can jump higher than fleas on a cats.

Medicine: Dan Ariely for demonstrating that expensive fake medicine is more effective than cheap fake medicine.

Cognitive Science: Toshiyuki Nakagaki, Hiroyasu Yamada, Ryo Kobayashi, Atsushi Tero, Akio Ishiguro and Agota Toth for demonstrating that slime moulds can solve puzzles.

Economics: Geoffrey Miller, Joshua Tyber and Brent Jordan for discovering that the fertility cycle of a lap dancer affects her tip-earning potential.

Physics: Dorian Raymer and Douglas Smith for proving that heaps of string or hair or almost anything else will inevitably tangle themselves up in knots.

Chemistry: Sheree Umpierre, Joseph Hill and Deborah Anderson for discovering that Coca-Cola is an effective spermicide (it was shared with C.Y. Hong, C.C. Shieh, P. Wu and B.N. Chiang who showed the opposite).

Literature: David Sims for his passionately written study "You Bastard: A Narrative Exploration of the Experience of Indignation within Organizations."

Obese diners choose convenience and overeating at Chinese buffets

When dining at Chinese Buffets, overweight individuals serve themselves and eat differently than normal weight individuals. This may lead them to overeat, according to a recent study by Cornell University's Food and Brand Lab. Compared to normal weight diners, overweight individuals sat 16 feet closer to the buffet, faced the food, used larger plates, ate with forks instead of chopsticks, and served themselves immediately instead of browsing the buffet.

"What's crazy is that these people are generally unaware of what they're doing – they're unaware of sitting closer, facing the food, chewing less, and so on," say Brian Wanink, lead author of this study and of the book "Mindless Eating: Why We Eat More Than We Think."

The study was published in the journal *Obesity* and includes observations of 213 diners at 11 all-you-can-eat Chinese restaurant buffets across the country. Study participants included a range of normal weight to obese diners, none of whom were Asian. Major study findings include:

- * 27% of normal-weight patrons faced the buffet compared to 42% of obese diners.
- * Overweight diners sat an average of 16 feet closer than normal-weight diners.
- * 16% of obese diners sat at a booth rather than a table compared to 38% of normal weight diners
- * 71% of normal-weight diners browsed the buffet before serving themselves compared to 33% of obese diners
- * 24% of normal-weight people used chopsticks compared with 9% of overweight people

"When food is more convenient people tend to eat more," say coauthor Collin R. Payne, New Mexico State University. "These seemingly subtle differences in behavior and environment may cause people to overeat without even realizing it."

Medical student gender and self-confidence

Females underestimate their abilities and males tend to overestimate theirs

INDIANAPOLIS – Despite performing equally to their male peers in the classroom and the clinic, female medical students consistently report decreased self-confidence and increased anxiety, particularly over issues related to their competency. A new study published in the September 2008 issue of *Patient Education and Counseling* found that female medical students also appeared less confident to patients.

"We observed third-year medical students interacting with individuals simulating patients and gave the students a battery of tests measuring non-verbal sensitivity. Female medical students self reported less self confidence than the male medical students and were also observed by trained raters to be less confident. Despite objective test performance that is equal to or greater than their male classmates there was something about the way in which the female medical students were observed and experienced their communication with patients that made them less confident" said the study's senior author Richard M. Frankel, Ph.D., professor of medicine at the Indiana University School of Medicine and a Regenstrief Institute research scientist.

Observing the female medical students and finding that they actually appeared less confident in their interaction with patients than male counterparts answered the important question of whether women were simply more willing than men to admit that they are feeling anxious, stressed or that they lack confidence in their abilities.

Women now comprise more than half of the applicants to medical schools in the United States but medical educators may not be aware of gender differences in their student population, the study authors note.

"Our finding of decreased confidence among female medical students is important because it makes it very clear that somewhere in the training of future physicians, the issue of confidence needs to be addressed.

Accomplishing this may be as straightforward as increasing faculty sensitivity and changing some simple learned behavior, but we will need more research to fully understand this phenomenon and its implications for medical education," said Dr. Frankel, a medical sociologist who studies both medical education and the doctor-patient relationship.

A literature survey by the study authors, which accompanied their observational report and analysis, shows that while there is no consistent gender difference in academic performance, female medical students tend to underestimate their abilities while males tend to overestimate theirs.

The literature survey also found that by the end of medical school, male students had achieved a greater level of identification with the role of doctor than female students with the same medical school experience. Interestingly, only female students reported thinking about confidence in their knowledge when asked to assess their identification with the role of doctor.

In a future study the research team hopes to observe how doctors' confidence in their abilities change over time from medical school through residency training to medical practice.

Authors of the current study are Danielle C. Blanch and Judith A. Hall of Northeastern University, Debra L. Roter of Johns Hopkins Bloomberg School of Public Health. The study was funded by the Fetzer Institute of Kalamazoo, Mich.

Nerds rejoice: Braininess boosts likelihood of sex

* 15:57 03 October 2008

* NewScientist.com news service

* **Ewen Callaway**

Lonely men ought to flaunt their copies of New Scientist. Women looking for both one-night stands and long-term relationships go for geniuses over dumb jocks, according to a new study of hundreds of university students.

"Women want the best of both worlds. Not only a physically attractive man, but somebody in the long term who can provide for them," says Mark Prokosch, an evolutionary psychologist at Elon University in North Carolina, who led the study.

To many women, a smart man will appeal because he is likely to be clever enough to keep his family afloat. But he may also pass on "good" genes to his children, say Prokosch and his colleagues at the University of California, Davis.

Rather than ask women to rate qualities they seek in men, as other studies had done, Prokosch's team asked 15 college men to perform a series of tasks on camera.

The volunteers read news reports, explained why they would be a good date, and what would be the ramifications of the discovery of life on Mars. They also threw and caught a Frisbee to parade their physical appeal. Each potential suitor also took a quantitative test of verbal intelligence.

Smart is sexy

More than 200 women watched a series of these videos before rating each man's intelligence, attractiveness, creativity and appeal for a short-term or long-term relationship.

While the difference between short- and long-term mates may amount to a boozy decision students face each weekend, it has some evolutionary significance, Prokosch says. In potential husbands, women look for signs that a man might be a good provider and father. In one-night stands, women are on the prowl for little more than good genes, not to mention a good time.

Women proved to be decent judges of intelligence, with their scores generally matching each man's intelligence test results.

As for picking a bed-mate, the men's actual smartness proved a reliable indicator of their appeal for both brief hook-ups and serious relationships – which came as something of a surprise. Other studies have suggested that, for women anticipating short-term relationships, a man's braininess isn't foremost in their minds.

The disparate results may be due to women's lack of awareness that intelligence also affects the attractiveness of candidates for quick flings – how intelligent women perceived a man to be influenced his desirability as a long-term mate much more than his appeal for a one-night stand.

Bright and beautiful

Martie Haselton, an evolutionary psychologist at the University of California in Los Angeles, also notes that although women were good judges of intelligence, they weren't perfect. In many cases, women rated good hook-ups as dunces, when their intelligence scores indicated otherwise.

"There could be aspects of intelligence that we pick up on when we interact with a person and that affect our assessment of them, even if we wouldn't label it as intelligence," she says.

But some things never change. Looks were still a much more powerful predictor of sex appeal than brains. "Women are still going for the hunk," Prokosch says. "If you had an option to pick from five different people, you would pick the most attractive one."

So in a perfect world, women want a Nobel prize winner with movie-star looks. Creativity also proved to be a sought-after trait, and Prokosch's team is currently working on an objective measure of creativity, similar to the intelligence test they used.

However, in a world of limited resources, not every woman gets what she wants, and some are bound to fall for ugly, unintelligent and uncreative men. "There's always other people out there that find everything attractive," Prokosch says. *Journal reference: Evolution and Human Behavior (DOI: 10.1016/j.evolhumbehav.2008.07.004)*

Sick leave 'link to early death'

People who have long spells of sick leave for psychiatric reasons are twice as likely to die from cancer as healthier employees, research suggests.

The "unexpected" finding could help pick out at-risk groups, the University College London researchers reported in the *British Medical Journal*.

Among 6,500 civil servants, those who had taken a long period of sick leave had a 66% higher risk of early death.

The cancer risk may be due to depressed people not seeing a doctor soon enough.

Sickness records were assessed from London-based employees in 20 Whitehall departments between 1985 and 1988 and compared with mortality up until 2004.

Overall 288 people died during the study.

The 30% of people who had one or more stints of at least seven days off work had a 66% increased risk of premature death compared to those who had not had any long periods of sick leave, it was found.

The highest mortality risk was seen in those who had been off work with heart disease, stroke or related conditions who had more than four times the risk of premature death than those who had no long sickness absences.

Perhaps more surprisingly, absences due to common respiratory conditions and infections were also associated with an increased risk of death, the researchers said.

Possible reasons

Study leader Jenny Head said it was the first time work absence for psychiatric reasons such as depression had been linked to death from cancer.

"That was the unexpected finding," she said.

"We didn't study the reason, but it might be people that tend to be depressed might be less likely to seek help from a doctor or being prone to depression could affect your cancer prognosis or depression might affect adherence to treatment."

She added: "It would be useful for this information to be collected because we could identify groups with high risk of serious health problems".

An accompanying editorial in the *BMJ* suggested that information on sickness absence could provide GPs with a useful tool to identify workers with an increased risk of serious illness or risk of death.

Employers could also use the information to target help for work-related health problems such as stress, it said.

Dr Stuart Whitaker, senior lecturer in occupational health at the University of Cumbria, said: "It would seem sensible to expect that those who do take longer and more frequent periods of sickness absence are suffering with more severe health problems, than those who do not go off sick, and might be expected to have higher premature death rates.

"This study helps to demonstrate that and goes further in being able to show the increased risk for different types of conditions."

However he added more work was needed to determine how occupational health services could identify those at high risk and what interventions they would then use to prevent early death.

Children aware of white male monopoly on White House

Youngest citizens say exclusion due to voter prejudice

AUSTIN, Texas—Challenging the idea that children live in a color or gender blind world, a new study from The University of Texas at Austin reveals most elementary-school-age children are aware there has been no female, African-American, or Hispanic President of the United States. And, many of the children attribute the lack of representation to discrimination.

Rebecca Bigler, professor of psychology, and a team of researchers at the university and the University of Kansas have published their findings in the October issue of the journal *Analyses of Social Issues and Public Policy*.

During 2006, more than a year before Hillary Clinton and Barack Obama entered the presidential race, the researchers interviewed 205 children between the ages of five and 10 about their knowledge, attitudes and

beliefs about the similarities among U.S. presidents. In three studies, children from diverse racial and ethnic backgrounds answered questions about the absence of female, African-American and Hispanic presidents.

The researchers found most children are aware that women and minorities have been excluded from the U.S. presidency. Although most of the children believed people of all races and genders should be president, they offered surprising answers as to why only white males have held the nation's highest political office:

- * One in four participants said it is illegal for women and minorities to hold the office of president;

- * One in three children attributed the lack of female, African-American and Latino presidents to racial and gender bias on the part of voters; and

- * While some children expressed the belief that prejudice shapes how adults vote, another third of the participants said members of the excluded groups lacked the skills to hold the position.

"The U.S. presidency is a high profile case of racial and gender exclusion," Bigler, director of the Gender and Racial Attitudes Lab at the university, said. "And because this topic is not typically explained to children, they appear to create their own explanations for the exclusion."

Children generally were optimistic about the possibility that they could become president, the researchers found. However, girls who attributed the lack of female presidents to discrimination were more likely to report they could not become president. In contrast, African-American children who identified discrimination as the reason for the lack of diversity showed an increased interest in becoming president.

"Perhaps the increased interest in becoming president is a result of the long and well-known history of African-Americans' struggle to achieve equality in the United States," said Bigler. "Young girls are not as aware of the women's rights movements and are less likely to be knowledgeable about women's struggles to achieve political power."

Bigler notes the 2008 presidential election has the potential to significantly alter children's view.

"If Obama loses his bid for the presidency, there may be little change in children's attitudes, but it could fuel their perception that American voters are racially prejudiced," Bigler said. "In contrast, if Obama wins children may believe that exclusionary laws and racial prejudice no longer shape the outcomes of the presidential elections."

To learn more about Bigler's research on children's perspectives on the presidency, please read the feature story, "Primary Education: From their views on the White House to the playground, children need mentors' help to reject stereotypes" at: <http://www.utexas.edu/features/2008/stereotypes/>.