

## **200,000 year old human hair found in dung**

***Strands of hair from a human who lived 200,000 years ago have been found preserved inside fossilised hyena dung from South Africa.***

***By Richard Gray, Science Correspondent***

Palaeontologists found 40 strands of fossilised hair inside samples of coprolite, or fossilised dung, from a cave in South Africa that was used by brown hyaenas.

Until now the oldest samples of human hair were from a 9,000 year old mummy found in northern Chile. It is extremely rare for soft tissue such as hair, skin and muscle to survive more than a few hundred years and only hard tissue like bone is fossilised normally.

But scientists believe the new samples of hair are the remains of an early species of human that was scavenged by hyaenas after death, allowing the delicate hairs to be preserved inside the dung as it fossilised.

They now hope that future analysis of the hairs could help to shed light on exactly which species it came from, the colour of their hair and even the state of health of the person it came from.

Dr Lucinda Backwell, a palaeontologist at the University of Witwatersrand in Johannesburg, South Africa, who led the group that found the hairs, said: "This find is so unusual as the human fossil record at this time is exceedingly poor, and of course hair is relatively fragile and degrades easily. It is the first non-bony material in the early hominid fossil record. "As analytical techniques become more advanced they could shed light on what the person looked like, their state of health, and other aspects that cannot be investigated with current technologies."

The researchers, who include archaeologists from York University and University of Bradford, used tweezers to remove 40 hairs from a single piece of dung found in a fossilised hyena latrine near Sterkfontein caves, where other early human remains have been found.

They compared the fossilised hairs to samples from modern humans, primates and other animals in an attempt to identify them. They concluded that the width of the hairs is consistent with those of humans and the shape is similar to those found in modern humans. Scales on the hairs were also similar to those found on human hair as opposed to other primates.

The researchers, who have published their findings this month in the *Journal of Archaeological Science*, believe that the hair may have belonged to an early human species known as *Homo heidelbergensis*, which was living in Africa around 200,000 years ago, or could be from one of the first *Homo sapiens*, who are thought to have evolved around 195,000 years ago. They could not rule out, however, that it was from another, entirely new human species.

Dr Kirsty Penkman from York University attempted to extract DNA and protein from the hair samples but was unable to find any. The scientists hope that as techniques improve it may be possible to extract some in the future or that they may have more luck with other human remains that can be found in fossilised dung.

Experts now believe that fossilised dung may help to provide more examples of ancient human remains.

Dr Backwell added: "Brown hyaenas are scavengers, not hunters, so the hominid was dead by the time the hyena came upon it. "It would appear that predator dung could be a good source of human hair in the fossil record. "The contents of such dung could shed light on the ancient environments where early humans and their ancestors once lived."

## **Acupuncture eases chronic low back pain in SPINE trial**

***But penetrating skin and tailoring treatment may not be responsible for benefits***

SEATTLE— Acupuncture can help people with chronic low back pain feel less bothered by their symptoms and function better in their daily activities, according to the largest randomized trial of its kind, published in the May 11, 2009 *Archives of Internal Medicine*. But the SPINE (Stimulating Points to Investigate Needling Efficacy) trial raises questions about how the ancient practice actually works.

Compared to the group that got usual care, results were similar for all three of the SPINE trial's acupuncture groups: individualized, standardized, and simulated (without going through skin). Of the people who got any kind of acupuncture, an extra one in five were functioning significantly better at the end of the seven-week treatment—and an extra one in eight were still functioning better at one year.

"This study suggests that acupuncture is about as effective as other treatments for chronic back pain that have been found helpful," said SPINE trial leader Daniel C. Cherkin, PhD, a senior investigator at Group Health Center for Health Studies in Seattle. "But we found that simulated acupuncture, without penetrating the skin, produced as much benefit as needle acupuncture—and that raises questions about how acupuncture works."

The SPINE trial included 638 adult patients at two nonprofit health plans: Group Health Cooperative in Seattle and Northern California Kaiser Permanente in Oakland. They all rated the "bothersomeness" of their

chronic low back pain as at least a 3 on a 0-to-10 scale. None of them had received acupuncture before. They were randomly assigned to one of four groups:

- \* Individualized needle acupuncture, involving a customized prescription for acupuncture points from a diagnostician
- \* Standardized needle acupuncture, using a single prescription for acupuncture points on the back and backs of the legs, which experts consider generally effective for chronic low back pain
- \* Simulated acupuncture on those same standardized points, mimicking needle acupuncture but instead of a needle using a toothpick in a needle guide tube without penetrating the skin
- \* Usual care, which is the standard medical care they would have gotten anyway—and that all patients in all groups received

Everyone in the three acupuncture groups (individualized, standardized, or simulated) was treated twice a week for three weeks, and then weekly for four weeks. At eight weeks, half a year, and one year, researchers measured back-related dysfunction and how much symptoms bothered patients.

The SPINE team found that at eight weeks all three acupuncture groups were functioning substantially better, while the group getting only usual care was functioning only slightly better. Dysfunction scores improved significantly more for all three acupuncture groups than for the usual care group. These benefits lasted for a year, although they waned over time.

Notably, the outcomes for groups that received the needle and simulated forms of acupuncture did not differ significantly. So, although acupuncture effectively treated low back pain, that therapeutic benefit seemed to require neither tailoring acupuncture needle sites to an individual patient nor inserting needles into the skin.

"We don't know precisely why people got back pain relief from the simulated acupuncture," said Cherkin's co-author Karen J. Sherman, PhD, MPH, a senior investigator at Group Health Center for Health Studies. "Historically, some types of acupuncture have used non-penetrating needles. Such treatments may involve physiological effects that make a clinical difference." Or it might be all about the mind-body connection, she said: "Maybe the context in which people get treatment has effects that are more important than the mechanically induced effects."

Western medicine does not have highly effective medical treatments for chronic back pain, Cherkin said. Back pain is the number-one reason that Americans use complementary and alternative medicine (CAM), including acupuncture.

The National Center for Complementary and Alternative Medicine (NCCAM), part of the National Institutes of Health, funded the SPINE trial.

"The findings of this research show that acupuncture-like treatments, including simulated acupuncture, can elicit positive responses," said Josephine P. Briggs, MD, director of NCCAM. "This adds to the growing body of evidence that something meaningful is taking place during acupuncture treatments outside of actual needling. Future research is needed to delve deeper into what is evoking these responses."

*Cherkin and Sherman's SPINE trial co-authors were Richard A. Deyo, MD, MPH, of Oregon Health & Science University in Portland; Partap S. Khalsa, DC, PhD, of NCCAM's Division of Extramural Research; Andrew L. Avins, MD, MPH, Luisa Hamilton, MD, and Alice Pressman, MS, of Northern California Kaiser Permanente in Oakland; William E. Barlow, PhD of Cancer Research and Biostatistics and Group Health Center for Health Studies; and Laura Ichikawa, MS, Janet H. Erro, RN, MN, Kristin Delaney, MPH, and Rene Hawkes of Group Health Center for Health Studies.*

### **Smoking interferes with recovery from alcohol-related brain damage**

- \* Excessive drinking can damage the brain, especially the frontal and parietal cortices.
- \* Some of this damage is reversible with abstinence from alcohol.
- \* New findings show that chronic cigarette smoking is associated with poor recovery of brain blood flow during abstinence from long-term heavy drinking.

Alcohol-use disorders (AUDs) can damage the brain, particularly the frontal and parietal cortices, although this damage is at least partially reversible with sustained abstinence from alcohol. Chronic smoking is extremely common among individuals with AUDs. A new study has used longitudinal magnetic resonance imaging (MRI) of brain blood flow to show that smoking makes it harder for brain blood flow to recover from long-term heavy drinking.

Results will be published in the August issue of *Alcoholism: Clinical & Experimental Research* and are currently available at Early View.

"The brain's frontal lobes are involved in higher-order cognitive function, such as learning, short-term memory, reasoning, planning, problem solving, and emotional control," explained Anderson Mon, senior research fellow in the department of radiology at the University of California, San Francisco and corresponding

author for the study. "The parietal lobes are involved in aspects of attentional regulation and visuospatial processing. Chronic and excessive drinking is associated with neurobiological abnormalities in these regions, which contribute to the cognitive dysfunction frequently observed in those with AUDs after detoxification."

Cerebral perfusion is a measure of the amount of blood flow to brain tissue per unit time. A normal, uninterrupted flow of blood through the brain is necessary to supply brain tissue with sufficient essential compounds and oxygen for normal metabolism, and will also carry away metabolic byproducts. The brain is only about 1/50th of total body weight, but it demands about 20 percent of the heart's oxygen-rich blood.

"In general, AUDs are associated with reduced perfusion," said Mon. "With abstinence from alcohol, brain perfusion abnormalities may recover, but there are several factors that may influence recovery, such as age, diet, exercise, genetic predispositions and – the topic of our research – other substances such as tobacco products."

Mon and his colleagues measured brain perfusion in the frontal and parietal cortices of three groups of study participants: 19 non-smoking alcohol-dependent (ALC) patients, and 22 smoking ALC patients at one and five weeks of abstinence from alcohol; as well as 28 age-matched non-smoking, light-drinking controls.

Results showed that even though cerebral perfusion among the ALC individuals, as a whole, improved with abstinence from alcohol, those ALC who were chronic smokers demonstrated significantly less perfusion recovery, particularly in the frontal lobes.

"At one week of abstinence, both smoking and non-smoking ALC patients had similar frontal and parietal gray matter perfusion; and both groups had lower perfusion than normal controls," said Mon. "However, after five weeks of abstinence, frontal and parietal gray matter perfusion of the non-smoking ALC patients recovered to normal control levels, whereas the smoking ALC group essentially showed no recovery."

Mon added that these findings are consistent with their earlier neuroimaging studies which found chronic smoking in ALC patients was associated with significantly diminished recovery of markers of neuronal, or nerve cell, and cell membrane integrity in multiple brain regions over the same period as this present study.

"These results suggest that patients who want to stop drinking should be offered an option to stop smoking," said Graeme Mason, associate professor of diagnostic radiology and psychiatry at Yale University. "However, any combined cessation has to be designed carefully."

Study results have been mixed, Mason noted. "One study showed that when patients choose to stop smoking and drinking together, they maintain sobriety longer," he said. "Conversely, another study showed the patients who were required to stop smoking at the same time as they stopped drinking did not stay sober as long as those who were not forced." Free will appears to be an important option, he emphasized.

"Additionally," said Mason, "patients may differ in their abilities to handle abstinence from multiple substances at the same time that they may be dealing with other major events in life, but more successful brain recovery may help make those difficult situations easier to manage appropriately. The work of Mons and colleagues certainly suggests that if a patient wishes to tackle both smoking and drinking at the same time, it will be worth the attempt to that person, helping them recover more complete brain function and stay sober, in addition to other, better known health benefits of smoking cessation."

"In short," said Mon, "prolonged and excessive alcohol consumption is bad for your brain, but a combination of alcohol with smoking is worse."

## **29 percent of cancer studies report conflict of interest**

### ***U-M researchers suggest increasing public funding of research to decrease potential bias from industry ties***

ANN ARBOR, Mich. - Nearly one-third of cancer research published in high-impact journals disclosed a conflict of interest, according to a new study from researchers at the University of Michigan Comprehensive Cancer Center.

The most frequent type of conflict was industry funding of the study, which was seen in 17 percent of papers. Twelve percent of papers had a study author who was an industry employee. Randomized trials with reported conflicts of interest were more likely to have positive findings.

"Given the frequency we observed for conflicts of interest and the fact that conflicts were associated with study outcomes, I would suggest that merely disclosing conflicts is probably not enough. It's becoming increasingly clear that we need to look more at how we can disentangle cancer research from industry ties," says study author Reshma Jagsi, M.D., D.Phil., assistant professor of radiation oncology at the U-M Medical School.

The researchers looked at 1,534 cancer research studies published in prominent journals. Results of this current study appear online in the journal *Cancer*.

"A serious concern is individuals with conflicts of interest will either consciously or unconsciously be biased in their analyses. As researchers, we have an obligation to treat the data objectively and in an unbiased fashion. There may be some relationships that compromise a researcher's ability to do that," Jagsi says.

For example, she says, researchers might design industry-funded studies in a way that's more likely to produce favorable results. They might also be more likely to publish positive outcomes than negative outcomes.

"In light of these findings, we as a society may wish to rethink how we want our research efforts to be funded and directed. It has been very hard to secure research funding, especially in recent years, so it's been only natural for researchers to turn to industry. If we wish to minimize the potential for bias, we need to increase other sources of support. Medical research is ultimately a common endeavor that benefits all of society, so it seems only appropriate that we should be funding it through general revenues rather than expecting the market to provide," Jagsi says.

**Methodology:** The researchers looked at all original clinical cancer research published in five top oncology journals and three top general medical journals in 2006. The journals included were the New England Journal of Medicine, the Journal of the American Medical Association, Lancet, the Journal of Clinical Oncology, the Journal of the National Cancer Institute, Lancet Oncology, Clinical Cancer Research and Cancer.

Articles were analyzed to determine declared funding sources and conflicts of interest. A conflict of interest was identified if it was explicitly declared by the authors, if an author was an employee of industry at the time of publication, or if the study had industry funding.

**Additional authors:** Nathan Sheets; Aleksandra Jankovic, M.S.; Amy R. Motomura; Sudha Amarnath; and Peter A. Ubel, M.D.

**Reference:** *Cancer*, published online May 11, 2009; scheduled for print publication June 15, 2009

### **Study describes what companies should do to recover from a product recall**

A product recall can significantly affect a company's bottom line and its reputation, but a swift recall and restitution to purchasers can minimize harm to the company – and even improve customer satisfaction. A study examining more than 500 toy recalls between 1988 and 2007 suggests ways that firms can minimize the business impact of a recall.

The results of the study, conducted by researchers at the Georgia Institute of Technology and the University of Manitoba, were described on May 2 at the Annual Conference of the Production and Operations Management Society. This research was funded by the Social Sciences and Humanities Research Council of Canada.

"Recalls undermine trust in a specific brand and it can take the company a long time to recover from the damage to its reputation, but it doesn't have to take a long time if the company uses good crisis management tactics," said Manpreet Hora, an assistant professor in Georgia Tech's College of Management. "Reducing the time it takes to recall a product will have a positive effect on consumers' willingness to purchase other products from the same company and if the recall is handled well, the stock price may recover to the same level as before the incident."

The best example of how to deal with a product recall is the Tylenol tampering case in the 1980s. Johnson & Johnson demonstrated that the safety of consumers was paramount by swiftly recalling the product, cooperating fully with regulators, and communicating openly about the issue, the researchers noted. Subsequently, the firm undertook a series of operational and design measures to ensure that such tampering would not occur again.

According to Hora and Hari Bapuji, an assistant professor at the University of Manitoba, effective recovery from a product recall begins with the way in which the company announces the recall. The firm should engage the public and immediately disclose all relevant recall and replacement information as soon as possible. Even if the recall was the result of a purchasing, out-sourcing or off-shoring decision, the company should take shared responsibility for the error, the researchers say.

"Consumers are forgiving, so if a firm apologizes, acknowledges the problem, and doesn't make the mistake again and again, consumers will continue to be loyal to that brand," said Hora.

After apologizing, the firm needs to get the product off store shelves and out of consumer' hands as quickly as possible. To do this, the firm must choose the best way to compensate the product purchasers and who will interface with the customer to price the restitution. There are many choices – the manufacturer, distributor or retailer can collect the recalled product and restitution can be provided by repairing or replacing the product or refunding the purchase price.

"Firms must keep in mind that the best choices are those that decrease the time it takes to recall the product and our analysis shows that it takes much longer to recall the product if the company that announces the recall is further away or upstream from the consumer," explained Hora.

Therefore firms need to collaborate and communicate well with their downstream distributors and retailers so that the distributors and retailers are willing to handle the recall for the manufacturer, leading to much faster

recalls. However, if there are millions of units being recalled, it can be a logistical nightmare for the retailers to handle the issue.

When it comes to the type of restitution, shorter recall time is associated with exchanging rather than refunding the recalled product. The firm will fare better if the consumer doesn't have to jump through a lot of hoops for restitution, which may mean allowing consumers to visit a local retailer to return the item for a refund. In other words, companies fare better if they recall the product and provide a refund through a retailer.

The researchers also studied how different types of recalls and defects affected the time it took to recall a product. Their results showed that manufacturing defects, such as lead content in toys, took much less time to recall than design defects such as detachable magnets. They also found that reactive recalls – recalls due to an incident, injury or death – were more likely than preventive recalls to result in exchanges, which dramatically reduced the recall time.

Hora and Bapuji are currently expanding their study to investigate how other industries recover from product recalls and whether firms learn from product recalls outside of their own industry. Since product recalls occur in many industries, the researchers are studying whether recalls by other firms lead companies to investigate their own production and supply chain processes to avoid the same issues.

"Having effective recovery strategies for dealing with product recalls efficiently and in a timely manner is imperative," noted Hora. "If a firm handles a product recall crisis well, it can be turned into a positive advantage for that company by actually increasing consumer satisfaction beyond where it was before the recall."

### **Walking often and far reduces risks in heart patients**

#### ***Study highlights:***

\* Walking longer at a slower pace improved heart health much more effectively than standard cardiac rehabilitation of walking a shorter distance at a brisker pace in overweight patients with coronary heart disease.

\* In this study, moderate-pace walking for 45–60 minutes on five to six days was considered high-calorie-burning exercise.

\* Researchers said it's necessary to modify traditional rehabilitation because more heart patients are overweight.

DALLAS, May 11, 2009 — An exercise program that burns a lot of calories reduced cardiac risk factors better than standard cardiac rehabilitation in overweight coronary patients, researchers report in *Circulation: Journal of the American Heart Association*.

"The higher-caloric exercise, consisting of almost daily long-distance walking, resulted in double the weight loss and a greater fat mass loss than standard cardiac rehabilitation exercise," said Philip A. Ades, M.D., lead author of the study and professor of medicine and director of cardiac rehabilitation and prevention at the University of Vermont College of Medicine in Burlington. "And probably most importantly, these patients improved their insulin sensitivity to a greater degree."

The high-calorie expenditure regime was not more intensive than rehabilitation, but longer duration at lower intensity on more days.

In a first-of-its-kind study, researchers randomized 74 overweight cardiac rehabilitation patients (average age 64, 20 percent women) to either a high-caloric expenditure exercise regimen intended to burn 3,000 to 3,500 calories a week or a standard rehab therapy burning 700 to 800 calories weekly.

After five months, compared to the group doing traditional rehabilitation, patients in the high-calorie-burning group had:

- significantly greater improvement in 10 heart risk factors, including insulin sensitivity (a hallmark of the metabolic syndrome), total cholesterol and the total cholesterol/good cholesterol ratio, blood pressure, and cardio-respiratory fitness; and
- a greater average reduction in weight (18 vs. 8 pounds), body fat, (13 vs. 6 pounds) and waistlines (2.7 vs. 2 inches).

Researchers said all of these changes were statistically significant.

"Cardiac rehab has essentially remained the same since the 1970s because it has a mortality benefit," Ades said. "But it doesn't burn many calories and things have changed. Eighty percent of our rehabilitation patients are now overweight and many of them are becoming diabetic. It's a different time in terms of what we need to do in cardiac rehab."

Excessive weight increases the risk of heart attacks and is associated with an increase in other heart risks factors, including high cholesterol, hypertension and diabetes.

High-calorie-expenditure exercise consisted of walking for 45 to 60 minutes a day at a moderate pace – a lower speed than standard therapy – for five to six days a week. Standard rehabilitation involved walking, biking or rowing for 25 to 40 minutes at a brisker pace three times a week.

While standard rehabilitation has benefit, the high-calorie-burning exercise increased the benefit, which is crucial with the increasing prevalence of obesity, researchers noted. The study’s message is “walk often and walk far.”

However, Ades said cardiac patients require supervision by medical staff.

“Since they were walking at a lower intensity, we were comfortable with them doing it on their own,” Ades said. “We suspect that the general applicability of the high-caloric expenditure exercise programs in cardiac rehabilitation will be broad, although staff and patients will need to be comfortable with performing much of the five- to six-day-per-week exercise program away from the highly monitored rehab facility.”

The two groups were similar at baseline in age, gender, body weight and fat distribution. After five months, the patients were left more on their own to continue their exercise programs, which most did.

“If you start patients in this program with the proper support, and you start getting positive results, it is surprising to me how well it is accepted,” Ades said. “The amount of exercise wasn’t the problem; and the fact that they were losing weight supported the behavior change.”

One year after entering the study, both groups had regained a few pounds from their five-month weights, an average of 2.9 pounds for the high-exercise group and two pounds for the low-exercise patients, not a significant difference between the two. However, weight and body fat remained significantly lower in both groups. Researchers are following the participants to determine whether high-calorie exercise improves the incidence of death and disability.

*Co-authors are Patrick D. Savage, M.S.; Michael J. Toth, Ph.D.; Jean Harvey-Berino, Ph.D., R.D.; David J. Schneider, M.D.; Janice Y. Bunn, Ph.D.; Marie C. Audelin, M.D.; and Maryann Ludlow, R.D. Individual author disclosures can be found on the manuscript.*

*The study was supported by grants from the National Institutes of Health and the General Clinical Research Center at the University of Vermont College of Medicine.*

## **Research finds Kava safe and effective**

### ***Extract of Kava useful in treating anxiety and improving mood***

Researchers at the University of Queensland in Australia have found a traditional extract of Kava, a medicinal plant from the South Pacific, to be safe and effective in reducing anxiety.

To be published online this week in the Springer journal Psychopharmacology, the results of a world-first clinical trial which found that a water-soluble extract of Kava was effective in treating anxiety and improving mood. The Kava was prescribed in the form of tablets.

Lead researcher Jerome Sarris, a PhD candidate from UQ’s School of Medicine, said the placebo-controlled study found Kava to be an effective and safe treatment option for people with chronic anxiety and varying levels of depression.

“We’ve been able to show that Kava offers a natural alternative for the treatment of anxiety, and unlike some pharmaceutical options, has less risk of dependency and less potential of side effects,” Mr. Sarris said.

Each week participants were given a clinical assessment as well as a self-rating questionnaire to measure their anxiety and depression levels. The researchers found anxiety levels decreased dramatically for participants taking five tablets of Kava per day as opposed to the placebo group which took dummy pills.

“We also found that Kava had a positive impact on reducing depression levels, something which had not been tested before,” Mr. Sarris said. In 2002 Kava was banned in Europe, UK and Canada due to concerns over liver toxicity.

While the three-week trial raised no major health concerns regarding the Kava extract used, the researchers said larger studies were required to confirm the drug’s safety.

“When extracted in the appropriate way, Kava may pose less or no potential liver problems. I hope the results will encourage governments to reconsider the ban,” Mr. Sarris said.

“Ethanol and acetone extracts, which sometimes use the incorrect parts of the Kava, were being sold in Europe. That is not the traditional way of prescribing Kava in the Pacific Islands. Our study used a water-soluble extract from the peeled rootstock of a medicinal cultivar of the plant, which is approved by the Therapeutic Goods Administration of Australia and is currently legal in Australia for medicinal use.”

**Reference 1.** Sarris J et al. (2009). *The Kava Anxiety Depression Spectrum Study (KADSS): a randomized, placebo-controlled crossover trial using an aqueous extract of Piper methysticum.* Psychopharmacology. DOI 10.1007/s00213-009-1549-9 The full-text article is available to journalists as a pdf.

## Research says older people need more sun

Spending more time in the sunshine could help older people to reduce their risk of developing heart disease and diabetes.

Exposure to sunlight stimulates vitamin D in the skin and older people are more likely to have a vitamin D deficiency due to the natural aging process and changes in lifestyle.

Researchers at the University of Warwick have shown vitamin D deficiency is significantly associated with metabolic syndrome, a combination of medical and metabolic disorders that increase the risk of developing cardiovascular disease and diabetes.

The research team, led by Dr Oscar Franco at Warwick Medical School, investigated the association between vitamin D levels in the blood and the prevalence of metabolic syndrome in 3,262 people aged 50-70 years old in China.

His team found a high correlation between low vitamin D levels and the prevalence of metabolic syndrome. They found 94% of people in the study had a vitamin D (25-hydroxyvitamin D) deficiency or insufficiency. The results showed 42.3% of these people also had metabolic syndrome.

The results of the study, published in *Diabetes Care* journal, are consistent with the findings of other studies in Western populations and Dr Franco suggests vitamin D deficiency could become a global health problem.

He said: "Vitamin D deficiency is becoming a condition that is causing a large burden of disease across the globe with particular deleterious impact among the elderly. Our results are consistent with those found in British and American populations. We found that low vitamin D levels were associated with an increased risk of having metabolic syndrome, and was also significantly associated with increased insulin resistance."

Dr Franco said there were many factors which could explain why older people had less vitamin D in their blood, including changes in lifestyle factors such as clothing and outdoor activity.

He added: "As we get older our skin is less efficient at forming vitamin D and our diet may also become less varied, with a lower natural vitamin D content. Most importantly, however, the dermal production of vitamin D following a standard exposure to UVB light decreases with age because of atrophic skin changes. When we are older we may need to spend more time outdoors to stimulate the same levels of vitamin D we had when we were younger."

Vitamin D deficiency exists when the concentration of 25-hydroxy-vitamin D (25-OH-D) in the blood serum occurs at 12ng/ml (nanograms/millilitre) or less. The normal concentration of 25-hydroxy-vitamin D in the blood serum is 25-50ng/ml.

This study was carried out in collaboration with colleagues from the Shanghai Institute of Biological Sciences in China. The team recruited 3,262 community residents aged 50-70 from Beijing and Shanghai in China as part of the Nutrition and Health of Aging Population in China (NHAPC) project.

Dr Franco added: "Vitamin D deficiency is now recognised as a worldwide concern and metabolic syndrome has become a global epidemic. More research is needed to find out why older people are more likely to have lower levels of vitamin D and how this is linked to the development of metabolic syndrome and related metabolic diseases." *The study is published online ahead of publication in Diabetes Care*

## Earliest animal traces solve time-gap mystery

\* 17:07 11 May 2009 by Jeff Hecht

Meet the ancestors: blobs of gelatinous goo that were some of the first animals on Earth.

The fossil traces have been discovered in Canadian rocks some 850 million years old – potentially solving a major problem for the origin of animal life.

And going back in time another two billion years, evidence of the earliest known cave-dwelling organisms are offering a glimpse of how life left the seas and conquered the continents.

### Ancient traces

The previous oldest animal fossils date from "only" 650 million years ago, although "molecular clocks" based on rates of genetic divergence indicate that animals should have originated about 850 million years ago. The new findings may therefore help solve the problem of the 200 million-year-gap.

Palaeontologists have looked long and hard for traces left by the first multi-celled organisms, fully aware that the soft-bodies might have left very few fossils.

The breakthrough came when Elizabeth Turner, of Laurentian University in Sudbury, Ontario, spotted odd patterns in the rocks of 850-million-year-old limestone reefs in the Mackenzie Mountains of Canada's Northwestern territory, and has spent the last 15 years, with Fritz Neuweiler of University Laval in Quebec, trying to deduce their origin.

Now Turner and Neuweiler, along with David Burdige of Old Dominion University in Virginia, have shown that the patterns match the distinctive textures found in reefs built by sponges.

### **'Gelatinous goo'**

Studies of modern sponges show that when their collagen structure decays it calcifies and leaves a signature pattern. Since collagen is a fibrous protein found only in animals, some ancestral animal must have lived in the ancient reef, they argue.

The animal consisted of "cells living embedded in a scaffold of collagen, which they extruded to make their home," says Turner. "There probably were more than one type of cell, but we can't tell." Nothing like it lives today, but if we saw one it would look like "a little blob of gelatinous goo", she says.

The presence of animals this early in Earth's history would resolve the long-standing disparity between molecular clocks and the fossil record, and show that the evolution of animals began before the Earth slipped twice into a global deep freeze.

"I applaud the approach of looking for distinctive textures seen along with sponge skeletons in younger rocks," says Andrew Knoll of Harvard University. "It's a good first step, but it's not yet proof."

### **Cave life**

Meanwhile evidence of Earth's earliest cave dwellers offers a new glimpse of how life conquered the planet. Birger Rasmussen of the Curtin University of Technology, Western Australia, and colleagues report that complex microbial communities thrived in protective cavities on land as early as 2.75 billion years ago.

The discovery of the cavity-dwelling microbes challenges our view of where and how quickly life spread onto land and may have important implications for life on Mars, says Rasmussen. Although microbes have been flourishing in the oceans for about 3.5 billion years, the absence of oxygen and ozone to block ultraviolet radiation from the sun made the Earth's surface a harsh environment until 2.4 billion years ago.

The only life that had been known to venture onto that surface were simple cyanobacteria (also known as blue-green algae) that during the last few hundred million years of that period formed mats and mounds mixed with sediment called stromatolites in shallow fresh water

Now Rasmussen has found these primitive land dwellers had company hiding under the surface – hiding in a complex subterranean ecosystem fed by chemical nutrients produced by other bacteria.

### **Mars too?**

Microscopic examination reveals that millimetre-scale pillars of bacteria once lived in gas cavities trapped between layers of a 2.75-billion-year-old stromatolite, making them the oldest evidence of cavity dwellers by more than 1.5 billion years.

The microbes lived in cavities a centimetre or two high and up to 20 centimetres long, that were probably only centimetres beneath the surface – pressure would have flattened any cavities more than a metre down, says Rasmussen. But that was enough to protect the microbes from the harsh surface conditions.

Carbon and sulphur isotope levels indicate that some of the cavity-dwelling bacteria fed on methane bubbling up from lower levels of stromatolites, whilst others munched sulphur compounds, he says. The column shapes are complex and diverse, and resemble cavity-encrusting deposits formed by modern microbes.

Sub-surface micro-cavities may not only have been an important refuge on early Earth. They could have been even more important on Mars, where oceans were short lived and the atmosphere offered little protection, so conditions were not favourable for life to develop.

Today the Martian surface is inhospitable to life, but "micro-cavities are places on Mars where you might have conditions suitable for life currently," but they would more likely have harboured life on ancient Mars, Rasmussen says. *Journal references: Geology (Turner), DOI: 10.1130/25621A.1, (Rasmussen) DOI: 10.1130/G23500A.1*

## **Brain's problem-solving function at work when we daydream**

A new University of British Columbia study finds that our brains are much more active when we daydream than previously thought.

The study, published in the Proceedings of the National Academy of Sciences, finds that activity in numerous brain regions increases when our minds wander. It also finds that brain areas associated with complex problem-solving – previously thought to go dormant when we daydream – are in fact highly active during these episodes.

"Mind wandering is typically associated with negative things like laziness or inattentiveness," says lead author, Prof. Kalina Christoff, UBC Dept. of Psychology. "But this study shows our brains are very active when we daydream – much more active than when we focus on routine tasks."

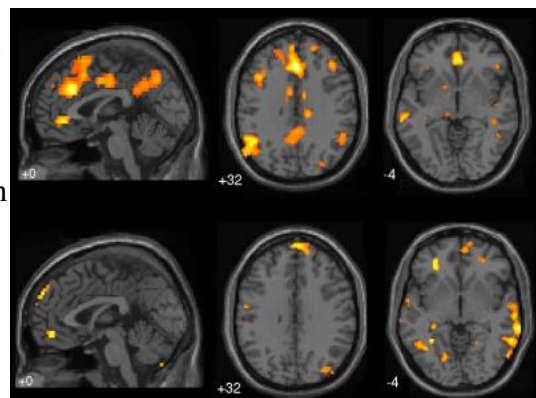


For the study, subjects were placed inside an fMRI scanner, where they performed the simple routine task of pushing a button when numbers appear on a screen. The researchers tracked subjects' attentiveness moment-to-moment through brain scans, subjective reports from subjects and by tracking their performance on the task.

The findings suggest that daydreaming – which can occupy as much as one third of our waking lives – is an important cognitive state where we may unconsciously turn our attention from immediate tasks to sort through important problems in our lives.

Until now, the brain's "default network" – which is linked to easy, routine mental activity and includes the medial prefrontal cortex (PFC), the posterior cingulate cortex and the temporoparietal junction – was the only part of the brain thought to be active when our minds wander.

However, the study finds that the brain's "executive network" – associated with high-level, complex problem-solving and including the lateral PFC and the dorsal anterior cingulate cortex – also becomes activated when we daydream.



*These are fMRI brain scans from UBC Mind Wandering Study. Courtesy of Kalina Christoff.*

"This is a surprising finding, that these two brain networks are activated in parallel," says Christoff. "Until now, scientists have thought they operated on an either-or basis – when one was activated, the other was thought to be dormant." The less subjects were aware that their mind was wandering, the more both networks were activated.

The quantity and quality of brain activity suggests that people struggling to solve complicated problems might be better off switching to a simpler task and letting their mind wander.

"When you daydream, you may not be achieving your immediate goal – say reading a book or paying attention in class – but your mind may be taking that time to address more important questions in your life, such as advancing your career or personal relationships," says Christoff.

*The research team included members who are now at Stanford University and University of California, Santa Barbara*  
*View the study at: <http://www.pnas.org/content/early/recent> (after 5 p.m. EST May 11).*

## **First analysis of swine flu spread supports pandemic plan**

\* 19:00 11 May 2009 by **Andy Coghlan**

H1N1 swine flu is spreading fast enough to justify the preparations for a pandemic, say epidemiologists who've analysed the pattern of spread so far.

"The message is that the epidemic is spreading very much as expected based on past flu epidemics," says Christophe Fraser of Imperial College London, and co-leader of the analysis team.

The results suggest that the H1N1 virus is showing "sustained human-to-human transmission", thereby justifying the WHO's pandemic phase 5 rating, one short of the most severe.

By analysing the pattern of spread within and beyond Mexico, where the epidemic emerged in February, the researchers estimate that on average, each person who contracts flu passes it on to between 1.4 and 1.6 other people. Whenever this value, called the reproductive number or  $R_0$ , is more than 1, it means that a disease is transmissible, and the higher the number, the easier it's transmitted.

The values found match or are less than those for previous flu epidemics, in 1918, 1957 and 1968.

But while the speed of spread is now better understood, researchers say they need more data to assess how dangerous the new virus is. "Our early analysis would suggest this is going to be an outbreak comparable to that of 20th century pandemics regarding the extent of its spread," says Neil Ferguson, co-leader of the team.

"However, it's very difficult to quantify the human health impact at this stage," he said.

### **Case fatalities**

Their best estimate from the Mexican fatalities is that the virus kills 0.4 per cent of those it infects on average, ranging from 0.3 to 1.5.

"So while substantial uncertainty remains, clinical severity appears less than that seen in 1918, but comparable with that seen in 1957," says the journal report. However, this is the "first wave" of the virus – scientists don't yet know whether the virus will become more dangerous.

Ferguson and his colleagues reached their latest estimates by assuming that cases in visitors to Mexico were much better investigated than those in Mexico itself, where the virus circulated invisibly for months before fuller surveillance was introduced.

"We used indirect detective measures to work it out," says co-leader of the team, Christophe Fraser, also at Imperial. "We had good data on people crossing in and out of Mexico, and assumed they were representative of the numbers of people originally infected in Mexico," he explained.

So from the figures, they estimate that between 6000 and 32,000 individuals in Mexico have had the virus, with a central estimate of 22,000. From this, they worked out the  $R_0$  estimates.

### **Virus mutations**

They reached a similar  $R_0$  figure, 1.2, when they worked backwards by tracking genetic mutations in the virus since the epidemic originated. But the team says there's more uncertainty about how lethal the virus is, because there have been relatively few deaths so far. "That's the tricky one," says Fraser.

Figures released today by the WHO reveal that there have been 4694 cases worldwide, with 48 deaths in Mexico, three in the US, and 1 each in Canada and Costa Rica.

"Much remains to estimate the clinical severity of infection," say the researchers.

Equally difficult is to predict how the virus will evolve. But they warn that as the flu season gets underway in the southern hemisphere, it will need to be carefully monitored to find out whether climatic conditions make things better or worse, whether the virus develops resistance to anti-flu drugs, and whether vaccination makes any difference to survival.

"The key trade-off remains the balancing of the economic and societal cost of interventions, such as school closure, against the numbers of lives saved through use of such measures," they say. "Where substantial antiviral stockpiles are available, a secondary trade-off is the extent to which large-scale prophylaxis is justified, given the potential of high level resistance developing." *Journal reference: Science DOI: 10.1126/science.1176062*

## **Vitamin supplements may cut benefits of exercise**

\* 22:00 11 May 2009 by **Linda Geddes**

Free radicals aren't always the bad guys. It even seems that popping antioxidants to mop them up might reduce some of the beneficial effects of exercise.

Free radicals have long been thought to contribute to the ageing process, which is one reason why people take antioxidant supplements such as vitamin C or E.

However, other studies have hinted that taking antioxidants may hasten death through an unknown mechanism. One possibility is that they interfere with the beneficial effects of exercise, as there are hints that free radicals might be used by the body to prevent cellular damage after exercise.

***Supplements of antioxidants such as vitamins C and E are thought by many to help fight the ageing process, but they may make things worse (Image: Image Source/Rex)***

To investigate further, Michael Ristow at the University of Jena in Germany and his colleagues recruited 40 volunteers, and asked half of them to take 1000 milligrams of vitamin C and 400 international units of vitamin E per day – equivalent to amounts in some vitamin supplements. They were also asked to exercise for 85 minutes a day, five days a week, for four weeks.

Muscle biopsies showed a two-fold increase in a marker of free radicals called TBARS (thiobarbituric acid-reactive substances) in those volunteers who didn't take antioxidants, but no increase in those who did take the supplements – suggesting that they were indeed mopping them up.

### **Lost benefits**

Exercise is well known to have a beneficial effect on insulin resistance – a precursor condition to type 2 diabetes. However, when Ristow's team measured the effects of exercise on insulin sensitivity, they found no increase in those volunteers taking antioxidants, but a significant increase in those who didn't take the supplements.

"These data are fully in accord with recent work on the actions of reactive oxygen species in cells, although clearly at odds with the popular concept that dietary antioxidants are inevitably beneficial," says Malcolm Jackson at the University of Liverpool, UK, who was not involved in the research.

In fact, in this case, "antioxidants are preventing the health effects of exercise," adds Ristow, although he cautions that not all vitamin supplements contain such high doses of vitamin C and E.

These doses are also far higher than one would get from eating the recommended amount of fruit and vegetables, which do seem to have a positive effect on health – possibly because they contain other protective compounds. "Taking antioxidants cannot substitute for eating fruit and vegetables at all" says Ristow.

*Journal reference: Proceedings of the National Academy of Sciences (DOI: 10.1073/pnas.0903485106)*



## 18 and Under

### **The Marks of Childhood or the Marks of Abuse?**

By **PERRI KLASS, M.D.**

I had just started out in practice when one day I examined a little boy, maybe 4 years old, and discovered around his neck the clear mark of a noose. I asked him what had happened; he said he didn't know. I asked his mother; she said she didn't know, but it was the fault of her ex-husband. I had to tell her I was filing a report with the Department of Social Services - the child had clearly suffered an inflicted injury.

My training had included many slide shows about the stigmata of cigarette burns, belt marks and other suspicious injuries, but it was the first time I had been the person alone on the front line, looking at a mark on a child, knowing something was wrong.



**Brian Stauffer**

My colleague Dr. Lori Legano is a pediatrician who specializes in child abuse at the Frances L. Loeb Child Protection and Development Center at Bellevue Hospital. Part of her job is to testify in court and to speak to judges and juries about a range of marks and bruises and what they indicate. She has to integrate a pediatrician's understanding of child development and behavior with a growing body of forensic information about child abuse. Bumps and bruises, after all, can be expected in any young child who is learning to walk. But some injuries are inconsistent with developmental stage: "If you don't cruise, you don't bruise."

So a child who isn't mobile shouldn't have those marks, let alone broken bones. And then there are intrinsically suspicious marks, or marks in the wrong places.

This year, the study of child abuse is coming of age as a medical specialty. In November, the first medical board exam will be offered in a new official specialty, child abuse pediatrics. Knowledge and research that have accumulated over decades about the effects of physical abuse and sexual abuse are being codified into a curriculum; fellowship training in the field will have to meet certain standards; an expert, testifying in court, can expect to be questioned about being board-certified.

"When I started doing this in 1984, nothing that I do now was even known," said Dr. Carole Jenny, a professor of pediatrics at Brown and the director of the child protection team at Hasbro Children's Hospital in Providence, R.I. "The first week I was working in the field, it was a child who had reportedly had a torn hymen or no hymen, and the defense attorney said, 'But doctor, aren't some children born without hymens?' and I said, 'I don't know!' And we initiated a study in the newborn nursery and we counted 1,100 baby girls." Every one had a hymen.

Like most pediatricians, I am intimidated by the idea of testifying in court. But all of these specialists have answered questions from lawyers on many occasions; the witness box is a basic part of the landscape of the new specialty.

"So many of these victims are children who could never explain to us what happened to them - they're not swearable," said Marjory D. Fisher, chief of the special victims bureau in the Queens district attorney's office. Without pediatricians trained in child abuse, she continued, "we would never be able to prevail in these cases because the victims are too young; they don't possess the ability to testify."

In my training, from the beginning, I was taught to worry about burns. Cigarette burns were always suspicious; immersion burns suggested that a child might have been punished by being dunked in too-hot water. So, of course, it was cigarette burns that brought my own young son to the emergency room one night during my residency when I was on call; he had run full tilt into a stranger in a restaurant who was holding a lighted cigarette. (Yes, I trained so long ago that people could smoke in restaurants.)

Dr. Philip Hyden, medical director of the Kapi'olani Child Protection Center in Honolulu, is an expert on burns. To help figure out whether a burn could have occurred accidentally (as in an apartment building in which someone in another apartment flushed a toilet and the bath water suddenly turned scalding hot), he asks detectives to check the water temperature at the same time on the same day of the week that the injury occurred.

Go to the home, turn on the hot water, wait to see how hot it gets — and then you'll have an idea how long the child would need to have been in contact with the water for the burn. Could it have happened with a single splash, or was the child held in hot water?

"If Mom says the kid fell into the tub and you go into the bathroom and the water won't go higher than 125," Dr. Hyden told me, "you know that water can burn that kid, but it's going to take a lot of time to do it."

Regularly, he says, he finds himself trying to explain the physics of burns to a judge or jury: "The hotter the water, the much quicker the burn is, exponentially quicker rather than just linear."

When my son came to the emergency room with cigarette burns, I found out what it was like for a parent to watch doctors suspect child abuse. Did this story make sense? (Yes.) Did the child confirm it? (Yes.)

But the incident made enough of an impression on my colleagues that a year or so later, when the same child came back with a broken femur at age 4, an attending doctor said to me, with the harsh humor of the emergency room: "I don't know, Perri. First cigarette burns, now a major fracture — doesn't look so good for you." (I knew enough to be theoretically glad that abuse was on his mind; on the other hand, 20 years later, I haven't forgotten or forgiven the remark.)

To be board-certified in this new specialty will also mean thoroughly understanding the medical conditions that are sometimes mistaken for child abuse - the easily broken bones of osteogenesis imperfecta, for example, or the dramatic bruising that can happen with hemophilia. The parents of children with these medical conditions are often themselves traumatized when the suspicion of child abuse is raised, and one role for a specialist is to make sure that even esoteric alternative explanations are considered.

"We spend a lot of time ruling out abuse," Dr. Jenny said. Forty percent of the children referred to her for evaluation turn out, in her best judgment, not to have been abused.

The child abuse experts don't want the rest of us in the profession to stop thinking about the subject. "I think the average pediatrician can diagnose this, even though it's becoming a specialty," Dr. Legano said.

But it's an emotionally difficult diagnosis for a pediatrician to contemplate, especially when it concerns a family you feel you know well. And all too often, it is a diagnosis we fail to consider in families that don't match our mental profiles of abusers. That's why pediatricians and parents alike need all the clinical experience and all the science we can get, deployed on the side of the children.

## **Pig embryos could provide tougher transplant organs**

\* 22:00 11 May 2009 by **Andy Coghlan**

Pig embryos may provide better organs than fully developed pigs, suggest researchers.

To test the idea, Yair Reisner at the Weizmann Institute in Rehovot, Israel, and colleagues gave two diabetic monkeys pancreases from pig embryos. The tiny organs made insulin, grew to the right size, and were infiltrated by monkey blood vessels.

Embryos have evolved to dodge attack from the maternal immune system, so embryonic organs might stand a better chance

of surviving in their new host than adult ones, the team says. However, it is not yet clear whether they do in fact evade attack, because the monkeys were given immunosuppressant drugs.

"They've not made the case that these monkeys needed less immunosuppressive therapy," says David Cooper of the University of Pittsburgh. "Nor am I convinced the approach has advantages over transplantation of adult or neonatal pig [organ]," he said, pointing out that a monkey given adult pancreas cells in his lab needed no insulin for a year. *Journal reference: Proceedings of the National Academy of Sciences (DOI: 10.1073/pnas.0812253106)*

## **Tracking Cyberspies Through the Web Wilderness**

By **JOHN MARKOFF**

For old-fashioned detectives, the problem was always acquiring information. For the cybersleuth, hunting evidence in the data tangle of the Internet, the problem is different.

"The holy grail is how can you distinguish between information which is garbage and information which is valuable?" said Rafal Rohozinski, a University of Cambridge-trained social scientist involved in computer security issues.

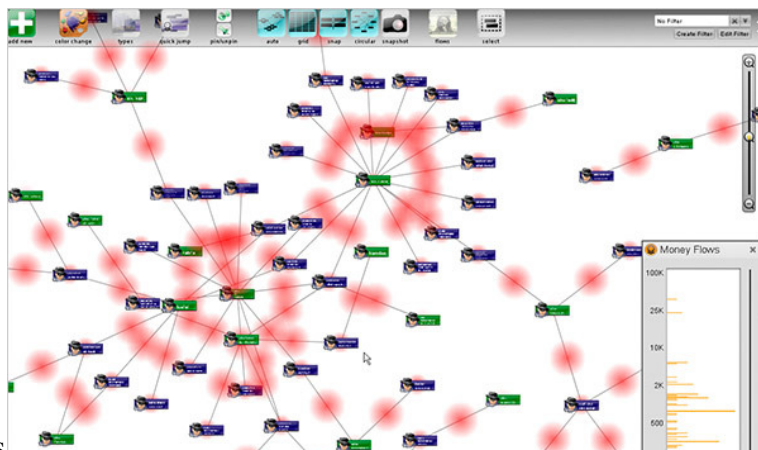
Beginning eight years ago he co-founded two groups, Information Warfare Monitor and Citizen Lab, which both have headquarters at the University of Toronto, with Ronald Deibert, a University of Toronto political scientist. The groups pursue that grail and strive to put investigative tools normally reserved for law enforcement agencies and computer security investigators at the service of groups that do not have such resources.

"We thought that civil society groups lacked an intelligence capacity," Dr. Deibert said.

They have had some important successes. Last year Nart Villeneuve, 34, an international relations researcher who works for the two groups, found that a Chinese version of Skype software was being used for eavesdropping by one of China's major wireless carriers, probably on behalf of Chinese government law enforcement agencies.

This year, he helped uncover a spy system, which he and his fellow researchers dubbed Ghostnet, which looked like a Chinese-government-run spying operation on mostly South Asian government-owned computers around the world.

Both discoveries were the result of a new genre of detective work, and they illustrate the strengths and the limits of detective work in cyberspace. The Ghostnet case began when Greg Walton, the editor of Infowar Monitor and a member of the research team, was invited to audit the Dalai Lama's office network in Dharamsala, India. Under constant attack - possibly from Chinese-government-sponsored computer hackers — the exiles had turned to the Canadian researchers to help combat the digital spies that had been planted in their communications system over several years.



**CONNECTIONS** Computer tools, like this one showing money flows, help researchers visualize the relationships between different sets of data generated from the Internet. Sorting valuable data from junk is a challenge for experts.

Both at the Dalai Lama's private office and at the headquarters of the exiled Tibetan government, Mr. Walton used a powerful software program known as Wireshark to capture the Internet traffic to and from the exile groups' computers.

Wireshark is an open-source software program that is freely available to computer security investigators. It is distinguished by its ease of use and by its ability to sort out and decode hundreds of common Internet protocols that are used for different types of data communications. It is known as a sniffer, and such software programs are essential for the sleuths who track cybercriminals and spies on the Internet.

Wireshark makes it possible to watch an unencrypted Internet chat session while it is taking place, or in the case of Mr. Walton's research in India, to watch as Internet attackers copied files from the Dalai Lama's network.

In almost every case, when the Ghostnet system administrators took over a remote computer they would install a clandestine Chinese-designed software program called GhOst RAT - for Remote Administration Terminal. GhOst RAT permits the control of a distant computer via the Internet, to the extent of being able to turn on audio and video recording features and capture the resulting files. The operators of the system - whoever they were - in addition to stealing digital files and e-mail messages, could transform office PCs into remote listening posts.

The spying was of immediate concern to the Tibetans, because the documents that were being stolen were related to negotiating positions the Dalai Lama's political representatives were planning to take in negotiations the group was engaged in.

After returning to Canada, Mr. Walton shared his captured data with Mr. Villeneuve and the two used a second tool to analyze the information. They uploaded the data into a visualization program that had been provided to the group by Palantir Technologies, a software company that has developed a program that allows investigators to "fuse" large data sets to look for correlations and connections that may otherwise go unnoticed.

The company was founded several years ago by a group of technologists who had pioneered fraud detection techniques at Paypal, the Silicon Valley online payment company. Palantir has developed a pattern recognition tool that is used both by intelligence agencies and financial services companies, and the Citizen Lab researchers have modified it by adding capabilities that are specific to Internet data.

Mr. Villeneuve was using this software to view these data files in a basement at the University of Toronto when he noticed a seemingly innocuous but puzzling string of 22 characters reappearing in different files. On a hunch, he entered the string into Google's search engine and was instantly directed to similar files stored on a vast computerized surveillance system located on Hainan Island off the coast of China. The Tibetan files were being copied to these computers.

But the researchers were not able to determine with certainty who controlled the system. The system could have been created by so-called patriotic hackers, independent computer activists in China whose actions are closely aligned with, but independent from, the Chinese government. Or it could have been created and run by Internet spies in a third country.

Indeed, the discovery raised as many questions as it answered. Why was the powerful eavesdropping system not password-protected, a weakness that made it easy for Mr. Villeneuve to determine how the system worked? And why among the more than 1,200 compromised government computers representing 103 countries, were there no United States government systems? These questions remain.

Cyberforensics presents immense technical challenges that are complicated by the fact that the Internet effortlessly spans both local and national government boundaries. It is possible for a criminal, for example, to conceal his or her activities by connecting to a target computer through a string of innocent computers, each connected to the Internet on different continents, making law enforcement investigations time consuming or even impossible.

The most vexing issue facing both law enforcement and other cyberspace investigators is this question of "attribution." The famous New Yorker magazine cartoon in which a dog sits at a computer keyboard and points out to a companion, "on the Internet, nobody knows you're a dog," is no joke for cyberdetectives.

To deal with the challenge, the Toronto researchers are pursuing what they describe as a fusion methodology, in which they look at Internet data in the context of real world events.

"We had a really good hunch that in order to understand what was going on in cyberspace we needed to collect two completely different sets of data," Mr. Rohozinski said. "On one hand we needed technical data generated from Internet log files. The other component is trying to understand what is going on in cyberspace by interviewing people, and by understanding how institutions work."

Veteran cybersecurity investigators agree that the best data detectives need to go beyond the Internet. They may even need to wear out some shoe leather.

"We can't become myopic about our tools," said Kent Anderson, a security investigator who is a member of security management committee of the Information Systems Audit and Control Association. "I continually bump up against good technologists who know how to use tools, but who don't understand how their tools fit into the bigger picture of the investigation."

*This article has been revised to reflect the following correction:*

**Correction: May 15, 2009**

*An article on Tuesday about the investigative tools being used in computer security operations misspelled the surname of a political scientist at the University of Toronto. He is Ronald Deibert, not Diebert. It also misstated the surname of the editor of Infowar Monitor. He is Greg Walton, not Watson.*

### **Participants in antidepressant drug trials are atypical patients, UT Southwestern researchers report**

DALLAS - One reason antidepressant medication treatments do not work as well in real life as they do in clinical studies could be the limited type of study participants selected, researchers at UT Southwestern Medical Center have found.

"We are basing our judgment of clinical care in the United States on samples of patients that are totally different from the patient population actually treated in primary care and mental health facilities," said Dr. Madhukar Trivedi, professor of psychiatry at UT Southwestern and senior author of a study published in the May issue of the American Journal of Psychiatry. "Antidepressants should not be seen as a panacea. The general belief is that they work well, but they are less effective in real-world practice, and more work is needed."

As part of the Sequenced Treatment Alternatives to Relieve Depression (STAR\*D) study scientists found that only 22 percent of the 2,855 participants treated with a commonly prescribed antidepressant would have met the criteria for inclusion in a typical antidepressant efficacy trial. Those who did meet criteria had shorter bouts of depression, quicker response to medication, less severe side effects and fewer adverse events compared with those people with depression who would have been excluded from such a trial, used to gain Food and Drug Administration approval of the drugs used.

The STAR\*D trial was the first large-scale study to define the effectiveness of several treatment steps in primary care and mental health settings for people with depression, Dr. Trivedi said.

The six-year, \$35 million STAR\*D study is the largest investigation on the treatment of major depressive disorder and is considered a benchmark in the field of depression research. It initially included more than 4,000 people from outpatient treatment sites across the country. About 65 percent of STAR\*D participants, however, had a medical co-morbidity such as diabetes that typically would have excluded them from participating in other clinical trials to test the efficacy of antidepressants, said Dr. Trivedi, co-principal investigator of STAR\*D.

"Evidence is growing that depression is like other chronic medical illnesses where it's not just one small, short bout, but a longer battle. People with depression may be at higher risk for other illnesses including obesity or diabetes, yet people with these conditions are excluded from drug trials for depression," Dr. Trivedi said.

STAR\*D provided evidence for step-by-step guidelines to address treatment-resistant depression. Many treatment-resistant depression patients would be excluded from drug efficacy trials because those trials typically eliminate study candidates who have previously tried treatment, have suicidal thoughts or have other psychiatric illnesses.

"These are the patients impacted by depression the most – highest suicide potential, highest unemployment rates, highest social impairment – and they are likely to produce poorer outcomes," Dr. Trivedi said. "That population doesn't get studied systematically in traditional pharmaceutical industry studies."

More research involving patients routinely seen in clinical practice coupled with pharmacogenetics is sorely needed to better understand how to best match patients with specific antidepressant treatments, Dr. Trivedi said.

He recommended that clinicians continue to prescribe antidepressants but with more realistic expectations about the disease's long-term nature. Dr. Trivedi said researchers should design future trials in real clinical practice settings where patients have co-morbidities, as he is doing in his current research.

*Other UT Southwestern researchers involved in the study were Dr. Mustafa Husain, professor of psychiatry and internal medicine; and Drs. Diane Warden and David Morris, both assistant professors of psychiatry. Researchers from seven other medical institutions were also involved.*

*STAR\*D is funded by the National Institute of Mental Health. Antidepressant medications were provided by Bristol-Myers Squibb, Forest, GlaxoSmithKline, King Pharmaceuticals, Organon, Pfizer and Wyeth.*

### **Swiss find sweet way to test water purity**

\* 14:09 12 May 2009 by **Catherine Brahic**

You'd be forgiven for assuming Swiss groundwater is as pure as water can get, and until recently there was no easy way to prove otherwise. But a common sweetener has provided a way to follow water from treatment plant out into the environment – however pristine it looks.

Thanks to the new method, Ignaz Buerge of the Swiss Federal Research Station, and colleagues have shown that between 10 and 20 per cent of water that was pumped from Swiss ground-water aquifers had made its way there from domestic waste water.

Caffeine has been used by engineers to trace leaks in faulty sewage treatment plants for many years. That's because we drink huge amounts of tea and coffee every day and wastewater treatment plants destroy almost all of it. So if scientists checking water quality in a lake or local water supply find caffeine, they know something is wrong.

But unlike caffeine, some artificial sweeteners pass through sewage treatment plants unscathed. They are then passed back into rivers and lakes. Buerge's team realised that sweeteners could make the ideal tracer for treated waste water.

#### **Tough taste enhancer**

They sampled water from waste-water treatment plants, rivers, lakes, and groundwater in Switzerland and tested it for four different artificial sweeteners. They found one of them, acesulfame potassium, virtually everywhere. It was the only compound that was abundant and persistent enough for them to detect in groundwater.

This makes acesulfame an ideal candidate for finding just how far waste water reaches.

"We can determine what fraction of waste water ends up groundwater," says Buerge. His study in the lower Glatt valley of Switzerland found that between 10 and 20 per cent of water that was pumped from ground-water aquifers had made its way there from domestic waste water.

This water has been treated and other compounds destroyed or removed, so there is no cause for immediate concern, says Buerge, but it shows that acesulfame is a good indicator of absolute water purity. The sweetener could also be used to test new methods of treating sewage.

*Journal reference: Environmental Science and Technology (DOI: 10.1021/es901127x)*

### **A Venus figurine from the Swabian Jura rewrites prehistory**

13 May 2009 Universitaet Tübingen

The 2008 excavations at Hohle Fels Cave in the Swabian Jura of southwestern Germany recovered a female figurine carved from mammoth ivory from the basal Aurignacian deposit. This figurine, which is the earliest depiction of a human, and one of the oldest known examples of figurative art worldwide, was made at least 35,000 years ago. This discovery radically changes our views of the context and meaning of the earliest Paleolithic art.

Between September 5 and 15, 2008 excavators at Hohle Fels near the town of Schelklingen recovered the six fragments of carved ivory that form the Venus. The importance of the discovery became apparent on September 9 when an excavator recovered the main piece of the sculpture that represents the majority of the torso. The figurine lay about 3 meters below the current surface of the cave in an area about 20 meters from the cave's entrance. The finds come from a single quarter meter and were recovered from within 8 cm in the vertical dimension. The Venus from Hohle Fels is nearly complete with only the left arm and shoulder missing. The excellent preservation and the close stratigraphic association of the pieces of the figurine indicate that the Venus experienced little disturbance after deposition.

The figurine originates from a red-brown, clayey silt at the base of about one meter of Aurignacian deposits. The Venus lay in pieces next to a number of limestone blocks with dimension of several decimeters. The find density in the area of the Venus is moderately high with much flint knapping debris, worked bone and ivory, bones of horse, reindeer, cave bear, mammoth, ibex, as well as burnt bone.

Radiocarbon dates from this horizon span the entire range from 31,000 – 40,000 years ago. The fact that the Venus is overlain by five Aurignacian horizons that contain a dozen stratigraphically intact anthropogenic features with a total thickness of 70 – 120 cm, suggests that figurine is indeed of an age corresponding to the start of the Aurignacian around 40,000 years ago.

Although much ivory working debris has been recovered from the basal Aurignacian deposits at Hohle Fels and the nearby site of Geißenklösterle, this sculpture is the first example of figurative art recovered from the basal Aurignacian in Swabia. The discovery of the Venus of Hohle Fels refutes claims that figurative representations and other symbolic artifacts first appear the later phases of the Swabian Aurignacian.

The Venus shows a range of entirely unique features as well as a number of characteristics present in later female figurines. The Venus of Hohle Fels lacks a head. Instead an off-centered, but carefully carved ring is located above the broad shoulders of the figurine. This ring, despite being weathered, preserves polish suggesting that the figurine was worn as a pendant. Beneath the shoulders, which are roughly as thick as they are wide, large breasts project forward. The figurine has two short arms with two carefully carved hands with visible fingers resting on the upper part of the stomach below the breasts.

The Venus has a short and squat form with a waist that is slightly narrower than the broad shoulders and wide hips. Multiple deeply incised horizontal lines cover the abdomen from the area below the breast to the pubic triangle. Several of these horizontal lines extend the back of the figurine and are suggestive of clothing or a wrap of some sort. Microscopic images show that these incisions were created by repeatedly cutting along the same lines with sharp stone tools.



***The Venus of Hohle Fels.* Foto: H. Jensen. Copyright: Universität Tübingen.**

**The pictures can only be used free for actual reporting until 25th of May 2009.**

The legs of the Venus are short and pointy. The buttocks and genitals are depicted in more details. The split between the two halves of the buttocks is deep and continues without interruption to the front of the figurine where the vulva is visible between the open legs. There can be no doubt that the depiction of oversized breast, extenuated buttocks and genitalia result from the deliberate exaggeration of the sexual features of the figurine. In addition to the many carefully depicted anatomical features, the surface of the Venus preserves numerous lines and deliberate markings.

Many of the features, including the emphasis on sexual attributes and lack of emphasis on the head, face and arms and legs, call to mind aspects of the numerous Venus figurines well known from the European Gravettien, which typically date between 22 and 27 ka BP. The careful depiction of the hands is reminiscent of those of Venuses including that of archetypal Venus of Willendorf, which was discovered 100 years earlier in summer of 1908. Despite the far greater age of the Venus of Hohle Fels, many of its attributes occur in various forms throughout the rich tradition of Paleolithic female representations.

The new figurine from Hohle Fels radically changes our view of origins of Paleolithic art. Prior to this discovery, animals and therianthrope imagery dominated the over two dozen figurines from the Swabian Aurignacian. Female imagery was entirely unknown. With this discovery, the notion that three dimensional female imagery developed in the Gravettian can be rejected. Also the interpretations suggesting that strong, aggressive animals or shamanic depictions dominate the Aurignacian art of Swabia, or even Europe as a whole, need to be reconsidered. Although there is a long history of debate over the meaning of Paleolithic Venuses, their clear sexual attributes suggest that they are a direct or indirect expression of fertility. The Venus of Hohle Fels provides an entirely new view of the art from the early Upper Paleolithic and reinforces the arguments that have been made for innovative cultural manifestations accompanying the rise of the Swabian Aurignacian.

While many researchers, including Nicholas Conard, assume that the Aurignacian artworks were made by early modern humans shortly after their migration into Europe, this assumption can neither be confirmed or refuted based on the available skeletal data from the Swabian caves.

*The Venus of Hohle Fels forms a center piece for a major exhibit in Stuttgart entitled Ice Age Art and Culture, which will run from September 18, 2009 – January 10, 2010.*



## Prairie dogs issue warnings in glorious technicolour

PRAIRIE dogs talk some pretty colourful talk. Not only do their alarm calls tell others about the type and size of approaching predators, but it seems they can also warn of the hue of an imminent threat.

Gunnison's prairie dogs are burrowing rodents that live in the grasslands of North America. Con Slobodchikoff of Northern Arizona University in Flagstaff and his colleagues had previously shown that they produce different alarm calls in response to humans, coyotes, domestic dogs and red-tailed hawks. For humans, the calls even vary according to the person's size. They react differently towards each call, all hiding if approached by humans, whereas only nearby animals hide if it is a hawk.



*Not only do the rodents' alarm calls tell others about the type and size of approaching predators, but they also seem to warn of the colour of an imminent threat (Image: Rick and Nora Bowers/Alamy)*

In the latest study, the team recorded the alarm calls as three similar-sized women wearing blue, yellow or green T-shirts walked past the prairie dogs 99 times. They found that the calls were similar for green and yellow T-shirts, but significantly different for blue (Animal Cognition, DOI: 10.1007/s10071-008-0203-y).

Prairie dogs have dichromatic vision, a form of colour blindness where only two of the three primary colours can be discerned. As they are sensitive to blue and yellow, this explains why they cannot distinguish green. Still, the fact that they can "talk" colour "probably makes this the most sophisticated animal communication system that has been decoded so far," says Slobodchikoff.

## Many Swine Flu Cases Have No Fever

By LAWRENCE K. ALTMAN

Many people suffering from swine influenza, even those who are severely ill, do not have fever, an odd feature of the new virus that could increase the difficulty of controlling the epidemic, said a leading American infectious-disease expert who examined cases in Mexico last week.

Fever is a hallmark of influenza, often rising abruptly to 104 degrees at the onset of illness. Because many infectious-disease experts consider fever the most important sign of the disease, the presence of fever is a critical part of screening patients. But about a third of the patients at two hospitals in Mexico City where the American expert, Dr. Richard P. Wenzel, consulted for four days last week had no fever when screened, he said.

"It surprised me and my Mexican colleagues, because the textbooks say that in an influenza outbreak the predictive value of fever and cough is 90 percent," Dr. Wenzel said by telephone from Virginia Commonwealth University in Richmond, where he is chairman of the department of internal medicine.

While many people with severe cases went on to develop fever after they were admitted, about half of the milder cases did not; nearly all patients had coughing and malaise, Dr. Wenzel said.

Also, about 12 percent of patients at the two Mexican hospitals had severe diarrhea in addition to respiratory symptoms like coughing and breathing difficulty, said Dr. Wenzel, who is also a former president of the International Society for Infectious Diseases. He said many such patients had six bowel movements a day for three days.

Dr. Wenzel said he had urged his Mexican colleagues to test the stools for the presence of the swine virus, named A(H1N1). "If the A(H1N1) virus goes from person to person and there is virus in the stool, infection control will be much more difficult," particularly if it spreads in poor countries, he said.

The doctor said he had also urged his Mexican colleagues to perform tests to determine whether some people without symptoms still carried the virus. He also said he had examined patients and data at the invitation of Dr. Samuel Ponce de León, who directs Mexico's national vaccination program.

Dr. Wenzel said that an unusual feature of the Mexican epidemic, which complicates the understanding of it, was that "in recent months five different influenza viruses have been circulating in Mexico simultaneously."

Pneumonia rates at one of the hospitals Dr. Wenzel visited, the National Institute for Respiratory Diseases, reached 120 per week recently compared with 20 per week during the past two years, suggesting a possible relation to the swine flu.

The pneumonias that the flu patients developed did not resemble the staphylococcal lung infections that were believed to be a common complication in the 1918-1919 influenza pandemic, Dr. Wenzel said.

He said the two Mexican hospitals were well prepared for an outbreak of respiratory disease. Mexican doctors activated a program to allay anxiety among staff members, offering the staff information, a hot line, psychological support and medical examinations.

"This aspect of epidemic response is not well appreciated in the United States in my estimation, yet is critical for success," Dr. Wenzel said. "We haven't put nearly enough into managing fear among health workers."

## Cold water ocean circulation doesn't work as expected

DURHAM, N.C. -- The familiar model of Atlantic ocean currents that shows a discrete "conveyor belt" of deep, cold water flowing southward from the Labrador Sea is probably all wet.

New research led by Duke University and the Woods Hole Oceanographic Institution relied on an armada of sophisticated floats to show that much of this water, originating in the sea between Newfoundland and Greenland, is diverted generally eastward by the time it flows as far south as Massachusetts. From there it disburse to the depths in complex ways that are difficult to follow.

A 50-year-old model of ocean currents had shown this southbound subsurface flow of cold water forming a continuous loop with the familiar northbound flow of warm water on the surface, called the Gulf Stream.

"Everybody always thought this deep flow operated like a conveyor belt, but what we are saying is that concept doesn't hold anymore," said Duke oceanographer Susan Lozier. "So it's going to be more difficult to measure these climate change signals in the deep ocean."

And since cold Labrador seawater is thought to influence and perhaps moderate human-caused climate change, this finding may affect the work of global warming forecasters.

"To learn more about how the cold deep waters spread, we will need to make more measurements in the deep ocean interior, not just close to the coast where we previously thought the cold water was confined," said Woods Hole's Amy Bower.

Lozier, a professor of physical oceanography at Duke's Nicholas School of the Environment and Bower, a senior scientist in the department of physical oceanography at the Woods Hole Institution, are co-principal authors of a report on the findings to be published in the May 14 issue of the research journal *Nature*.

Their research was supported by the National Science Foundation.

Climatologists pay attention to the Labrador Sea because it is one of the starting points of a global circulation pattern that transports cold northern water south to make the tropics a little cooler and then returns warm water at the surface, via the Gulf Stream, to moderate temperatures of northern Europe.

Since forecasters say effects of global warming are magnified at higher latitudes, that makes the Labrador Sea an added focus of attention. Surface waters there absorb heat-trapping carbon dioxide from the atmosphere. And a substantial amount of that CO<sub>2</sub> then gets pulled underwater where it is no longer available to warm Earth's climate.

"We know that a good fraction of the human caused carbon dioxide released since the Industrial revolution is now in the deep North Atlantic" Lozier said. And going along for the ride are also climate-caused water temperature variations originating in the same Labrador Sea location.

The question is how do these climate change signals get spread further south? Oceanographers long thought all this Labrador seawater moved south along what is called the Deep Western Boundary Current (DWBC), which hugs the eastern North American continental shelf all the way to near Florida and then continues further south.

But studies in the 1990s using submersible floats that followed underwater currents "showed little evidence of southbound export of Labrador sea water within the Deep Western Boundary Current (DWBC)," said the new *Nature* report.

Scientists challenged those earlier studies, however, in part because the floats had to return to the surface to report their positions and observations to satellite receivers. That meant the floats' data could have been "biased by upper ocean currents when they periodically ascended," the report added.

To address those criticisms, Lozier and Bower launched 76 special Range and Fixing of Sound floats into the current south of the Labrador Sea between 2003 and 2006. Those "RAFOS" floats could stay submerged at 700 or 1,500 meters depth and still communicate their data for a range of about 1,000 kilometers using a network of special low frequency and amplitude seismic signals.

But only 8 percent of the RAFOS floats' followed the conveyor belt of the Deep Western Boundary Current, according to the *Nature* report. About 75 percent of them "escaped" that coast-hugging deep underwater pathway and instead drifted into the open ocean by the time they rounded the southern tail of the Grand Banks.

Eight percent "is a remarkably low number in light of the expectation that the DWBC is the dominant pathway for Labrador Sea Water," the researchers wrote.

Studies led by Lozier and other researchers had previously suggested cold northern waters might follow such "interior pathways" rather than the conveyor belt in route to subtropical regions of the North Atlantic. But "these float tracks offer the first evidence of the dominance of this pathway compared to the DWBC."

Since the RAFOS float paths could only be tracked for two years, Lozier, her graduate student Stefan Gary, and German oceanographer Claus Boning also used a modeling program to simulate the launch and dispersal of more than 7,000 virtual "efloats" from the same starting point.

"That way we could send out many more floats than we can in real life, for a longer period of time," Lozier said.

Subjecting those efloats to the same underwater dynamics as the real ones, the researchers then traced where they moved. "The spread of the model and the RAFOS float trajectories after two years is very similar," they reported.

"The new float observations and simulated float trajectories provide evidence that the southward interior pathway is more important for the transport of Labrador Sea Water through the subtropics than the DWBC, contrary to previous thinking," their report concluded.

"That means it is going to be more difficult to measure climate signals in the deep ocean," Lozier said. "We thought we could just measure them in the Deep Western Boundary Current, but we really can't."

### **UCSB scientists document fate of huge oil slicks from seeps at coal oil point**

(Santa Barbara, Calif.) — Twenty years ago, the oil tanker Exxon Valdez was exiting Alaska's Prince William Sound when it struck a reef in the middle of the night. What happened next is considered one of the nation's worst environmental disasters: 10.8 million gallons of crude oil spilled into the pristine Alaskan waters, eventually covering 11,000 square miles of ocean.

Now, imagine 8 to 80 times the amount of oil spilled in the Exxon Valdez accident.

According to new research by scientists from UC Santa Barbara and the Woods Hole Oceanographic Institution (WHOI), that's how much oil has made its way into sediments offshore from petroleum seeps near Coal Oil Point in the Santa Barbara Channel. Their research, reported in an article being published in the May 15 issue of *Environmental Science & Technology*, documents how the oil is released by the seeps, carried to the surface along a meandering plume, and then deposited on the ocean floor in sediments that stretch for miles northwest of Coal Oil Point.

In addition, the research reveals that the oil is so degraded by the time it gets buried in the sea bed that it's a mere shell of the petroleum that initially bubbles up from the seeps. "These were spectacular findings," said Christopher Reddy, a marine chemist at WHOI and one of the co-authors of the new paper.

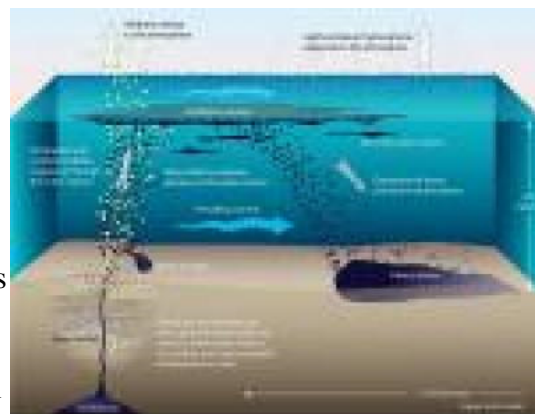
Other co-authors include UCSB's David Valentine, associate professor of earth science; and Libe Washburn, professor of geography; and Emily Peacock and Robert K. Nelson, both of WHOI.

The lead author is Christopher Farwell, who at the time of the research was an undergraduate studying chemistry at UCSB. Inspired by this project, Farwell has changed his career path and is now a graduate student at UCSB studying marine science and earth science. "It was a great opportunity," Farwell said. "I was able to cross over into a different discipline that allowed me to make a contribution and understand the process of science as a whole."

Valentine, who supervised Farwell's research, said, "It's unusual to have an undergraduate take the lead in such a significant study, and its success is a testament to Chris's perseverance."

In an earlier paper published in 2008, Valentine and Reddy documented how microbes devour many of the compounds in the oil emanating from the seeps. The new study examines the final step in the life cycle of the oil.

"One of the natural questions is: What happens to all of this oil?" Valentine said. "So much oil seeps up and floats on the sea surface. It's something we've long wondered. We know some of it will come ashore as tar balls, but it doesn't stick around. And then there are the massive slicks. You can see them, sometimes extending 20 miles from the seeps. But what is really the ultimate fate?"



*A graphic depicts what happens to the oil, from seep to the fallout plume.* John E. Cook, Woods Hole Oceanographic Institution

Based on their previous research, Valentine and Reddy surmised that the oil was sinking "because this oil is heavy to begin with," Valentine said. "It's a good bet that it ends up in the sediments because it's not ending up on land. It's not dissolving in ocean water, so it's almost certain that it is ending up in the sediments."

An all-night sampling marathon on the research ship R/V Atlantis, funded by the National Science Foundation, provided the means to test that hypothesis. With Farwell and Reddy leading the way, the team used what Reddy called an "old school" sampling device to take 16 sediment samples from the ocean floor, following a carefully calculated path mapped out by Farwell. The researchers were hoping that their route, described by Farwell as a "rectangle along the coast from Santa Barbara to Point Conception," would match the

trail of the plume. Farwell's calculations were perfect, Valentine said. The 16-point route yielded an unmistakable pattern of oil-saturated sediment all along the ship's path.

The scientists then painstakingly analyzed the samples using Reddy's comprehensive two-dimensional gas chromatograph (GCxGC). "What we saw is that we can link the seep oils to the oils in the sediment," Valentine said. "We can do that through the composition of select molecules that are specific to the oils from the seeps. So, being able to link them, and being able to quantify how much is there, we can see the pattern of the oil. It's coming from the seeps."

Washburn, who has been using radio waves to map ocean currents off Santa Barbara for a number of years, provided additional evidence. "Libe took a seven-year average of surface current flow in the region, and plotted that out," Valentine said. "It matched perfectly with our plume."

This research proved to be an extension of the 2008 study by Valentine and Reddy: that the oil has indeed degraded, largely eaten away by microbes, before it settles back to the ocean floor and becomes buried.

"For all of these samples, the bacteria seem to hit a common wall, where they don't eat anymore," Valentine said. "In the previous study, we were looking at subsurface biodegradation where there is no oxygen. Now, you still have thousands of compounds in that oil, but now we're seeing all of the evaporation and dissolution that happens to the slick, and then the biodegradation happens in the slick with oxygen present, and then when it falls to the sea floor, it continues to be biodegraded. All the oil seems to be biodegraded to the same point and then it just stops."

"It's dramatic how much the oil loses in this life cycle," Reddy said. "It's almost like someone who has lost 400 pounds."

It's the amount of residual oil that made it to the ocean floor that surprised all of the researchers. "Based on what we found in the sample cores at our sites, we calculated the amount of hydrocarbon in the whole area," Valentine said. "We have to make assumptions about how deep the sediment is, so we assume a range of between 50 centimeters and 5 meters. We come out with 8 to 80 Exxon Valdezes worth of oil, just in this area."

"When we got reviews for the paper, one reviewer said it should actually be more, because of how much has been degraded out," Farwell said. "The amount that actually seeped out is more like 11 to 110 Exxon Valdezes, just in this area."

Washburn thinks that this research will resonate among scientists who have studied oil. "I think it's giving us a lot of insight into the fate of oil and hydrocarbons in the ocean," the UCSB oceanographer said. "There may also be some applications for oil spills."

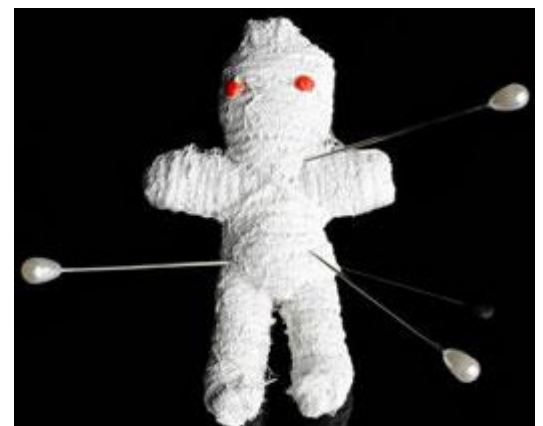
## **The science of voodoo: When mind attacks body**

\* 13 May 2009 by Helen Pilcher

Late one night in a small Alabama cemetery, Vance Vanders had a run-in with the local witch doctor, who wafted a bottle of unpleasant-smelling liquid in front of his face, and told him he was about to die and that no one could save him.

Back home, Vanders took to his bed and began to deteriorate. Some weeks later, emaciated and near death, he was admitted to the local hospital, where doctors were unable to find a cause for his symptoms or slow his decline. Only then did his wife tell one of the doctors, Drayton Doherty, of the hex.

Doherty thought long and hard. The next morning, he called Vanders's family to his bedside. He told them that the previous night he had lured the witch doctor back to the cemetery, where he had choked him against a tree until he explained how the curse worked. The medicine man had, he said, rubbed lizard eggs into Vanders's stomach, which had hatched inside his body. One reptile remained, which was eating Vanders from the inside out.



*There are numerous documented instances from many parts of the globe of people dying after being cursed (Image: Image Source/Rex)*

### **Great ceremony**

Doherty then summoned a nurse who had, by prior arrangement, filled a large syringe with a powerful emetic. With great ceremony, he inspected the instrument and injected its contents into Vanders' arm. A few minutes later, Vanders began to gag and vomit uncontrollably. In the midst of it all, unnoticed by everyone in the room, Doherty produced his pièce de résistance - a green lizard he had stashed in his black bag. "Look what has come out of you Vance," he cried. "The voodoo curse is lifted."

Vanders did a double take, lurched backwards to the head of the bed, then drifted into a deep sleep. When he woke next day he was alert and ravenous. He quickly regained his strength and was discharged a week later.

The facts of this case from 80 years ago were corroborated by four medical professionals. Perhaps the most remarkable thing about it is that Vanders survived. There are numerous documented instances from many parts of the globe of people dying after being cursed.

With no medical records and no autopsy results, there's no way to be sure exactly how these people met their end. The common thread in these cases, however, is that a respected figure puts a curse on someone, perhaps by chanting or pointing a bone at them. Soon afterwards, the victim dies, apparently of natural causes.

### **Voodoo nouveau**

You might think this sort of thing is increasingly rare, and limited to remote tribes. But according to Clifton Meador, a doctor at Vanderbilt School of Medicine in Nashville, Tennessee, who has documented cases like Vanders, the curse has taken on a new form.

Take Sam Shoeman, who was diagnosed with end-stage liver cancer in the 1970s and given just months to live. Shoeman duly died in the allotted time frame - yet the autopsy revealed that his doctors had got it wrong. The tumour was tiny and had not spread. "He didn't die from cancer, but from believing he was dying of cancer," says Meador. "If everyone treats you as if you are dying, you buy into it. Everything in your whole being becomes about dying."

Cases such as Shoeman's may be extreme examples of a far more widespread phenomenon. Many patients who suffer harmful side effects, for instance, may do so only because they have been told to expect them. What's more, people who believe they have a high risk of certain diseases are more likely to get them than people with the same risk factors who believe they have a low risk. It seems modern witch doctors wear white coats and carry stethoscopes.

### **The nocebo effect**

The idea that believing you are ill can make you ill may seem far-fetched, yet rigorous trials have established beyond doubt that the converse is true - that the power of suggestion can improve health. This is the well-known placebo effect. Placebos cannot produce miracles, but they do produce measurable physical effects.

The placebo effect has an evil twin: the nocebo effect, in which dummy pills and negative expectations can produce harmful effects. The term "nocebo", which means "I will harm", was not coined until the 1960s, and the phenomenon has been far less studied than the placebo effect. It's not easy, after all, to get ethical approval for studies designed to make people feel worse.

What we do know suggests the impact of nocebo is far-reaching. "Voodoo death, if it exists, may represent an extreme form of the nocebo phenomenon," says anthropologist Robert Hahn of the US Centers for Disease Control and Prevention in Atlanta, Georgia, who has studied the nocebo effect.

### **Life threatening**

In clinical trials, around a quarter of patients in control groups - those given supposedly inert therapies - experience negative side effects. The severity of these side effects sometimes matches those associated with real drugs. A retrospective study of 15 trials involving thousands of patients prescribed either beta blockers or a control showed that both groups reported comparable levels of side effects, including fatigue, depressive symptoms and sexual dysfunction. A similar number had to withdraw from the studies because of them.

Occasionally, the effects can be life-threatening (see "The overdose"). "Beliefs and expectations are not only conscious, logical phenomena, they also have physical consequences," says Hahn.

Nocebo effects are also seen in normal medical practice. Around 60 per cent of patients undergoing chemotherapy start feeling sick before their treatment. "It can happen days before, or on the journey on the way in," says clinical psychologist Guy Montgomery from Mount Sinai School of Medicine in New York. Sometimes the mere thought of treatment or the doctor's voice is enough to make patients feel unwell. This "anticipatory nausea" may be partly due to conditioning - when patients subconsciously link some part of their experience with nausea - and partly due to expectation.

### **Catching**

Alarming, the nocebo effect can even be catching. Cases where symptoms without an identifiable cause spread through groups of people have been around for centuries, a phenomenon known as mass psychogenic illness. One outbreak (see "It's catching") inspired a recent study by psychologists Irving Kirsch and Giuliana Mazzoni of the University of Hull in the UK.

They asked some of a group of students to inhale a sample of normal air, which all participants were told contained "a suspected environmental toxin" linked to headache, nausea, itchy skin and drowsiness. Half of the participants also watched a woman inhale the sample and apparently develop these symptoms. Students who inhaled were more likely to report these symptoms than those who did not. Symptoms were also more

pronounced in women, particularly those who had seen another apparently become ill - a bias also seen in mass psychogenic illness.

The study shows that if you hear of or observe a possible side effect, you are more likely to develop it yourself. That puts doctors in a tricky situation. "On the one hand people have the right to be informed about what to expect, but this makes it more likely they will experience these effects," says Mazzoni.

### **Catch 22**

This means doctors need to choose their words carefully so as to minimise negative expectations, says Montgomery. "It's all about how you say it."

Hypnosis might also help. "Hypnosis changes expectancies, which decreases anxiety and stress, which improves the outcome," Montgomery says. "I think hypnosis could be applied to a wide variety of symptoms where expectancy plays a role."

Is the scale of the nocebo problem serious enough to justify such countermeasures? We just don't know, because so many questions remain unanswered. In what circumstances do nocebo effects occur? And how long do the symptoms last?

It appears that, as with the placebo response, nocebo effects vary widely, and may depend heavily on context. Placebo effects in clinical settings are often much more potent than those induced in the laboratory, says Paul Enck, a psychologist at the University Hospital in Tübingen, Germany, which suggests the nocebo problem may have profound effects in the real world. For obvious reasons, though, lab experiments are designed to induce only mild and temporary nocebo symptoms.

### **Real consequences**

It is also unclear who is susceptible. A person's optimism or pessimism may play a role, but there are no consistent personality predictors. Both sexes can succumb to mass psychogenic illness, though women report more symptoms than men. Enck has shown that in men, expectancy rather than conditioning is more likely to influence nocebo symptoms. For women, the opposite is true. "Women tend to operate more on past experiences, whereas men seem more reluctant to take history into a situation," he says.

What is becoming clear is that these apparently psychological phenomena have very real consequences in the brain. Using PET scans to peer into the brains of people given a placebo or nocebo, Jon-Kar Zubieta of the University of Michigan, Ann Arbor, showed last year that nocebo effects were linked with a decrease in dopamine and opioid activity. This would explain how nocebos can increase pain. Placebos, unsurprisingly, produced the opposite response.

Meanwhile, Fabrizio Benedetti of the University of Turin Medical School in Italy has found that nocebo-induced pain can be suppressed by a drug called proglumide, which blocks receptors for a hormone called cholecystokinin (CCK). Normally, expectations of pain induce anxiety, which activates CCK receptors, enhancing pain.

### **Ultimate cause**

The ultimate cause of the nocebo effect, however, is not neurochemistry but belief. According to Hahn, surgeons are often wary of operating on people who think they will die - because such patients often do. And the mere belief that one is susceptible to a heart attack is itself a risk factor. One study found that women who believed they are particularly prone to heart attack are nearly four times as likely to die from coronary conditions than other women with the same risk factors.

Despite the growing evidence that the nocebo effect is all too real, it is hard in this rational age to accept that people's beliefs can kill them. After all, most of us would laugh if a strangely attired man leapt about waving a bone and told us we were going to die. But imagine how you would feel if you were told the same thing by a smartly dressed doctor with a wallful of medical degrees and a computerful of your scans and test results. The social and cultural background is crucial, says Enck.

Meador argues that Shoeman's misdiagnosis and subsequent death shares many of the crucial elements found in hex death. A powerful doctor pronounces a death sentence, which is accepted unquestioningly by the "victim" and his family, who then start to act upon that belief. Shoeman, his family and his doctors all believed he was dying from cancer. It became a self-fulfilling prophecy.

### **Nothing mystical**

"Bad news promotes bad physiology. I think you can persuade people that they're going to die and have it happen," Meador says. "I don't think there's anything mystical about it. We're uncomfortable with the idea that words or symbolic actions can cause death because it challenges our biomolecular model of the world."

Perhaps when the biomedical basis of voodoo death is revealed in detail we will find it easier to accept that it is real - and that it can affect any one of us.

## **Editorial: Breaking the voodoo spell**

### **The overdose**

Depressed after splitting up with his girlfriend, Derek Adams took all his pills... then regretted it. Fearing he might die, he asked a neighbour to take him to hospital, where he collapsed. Shaky, pale and drowsy, his blood pressure dropped and his breaths came quickly.

Yet lab tests and toxicology screening came back clear. Over the next 4 hours Adams received 6 litres of saline, but improved little.

Then a doctor arrived from the clinical trial of an antidepressant in which Adams had been taking part. Adams had enrolled in the study about a month earlier. Initially he had felt his mood buoyed, but an argument with his ex-girlfriend saw him swallow the 29 remaining tablets.

The doctor revealed that Adams was in the control group. The pills he had "overdosed" on were harmless. Hearing this, Adams was surprised and tearfully relieved. Within 15 minutes he was fully alert, and his blood pressure and heart rate had returned to normal.

### **It's catching**

In November 1998, a teacher at a Tennessee high school noticed a "gasoline-like" smell, and began complaining of headache, nausea, shortness of breath and dizziness. The school was evacuated and over the next week more than 100 staff and students were admitted to the local emergency room complaining of similar symptoms.

After extensive tests, no medical explanation for the reported illnesses could be found. A questionnaire a month later revealed that the people who reported symptoms were more likely to be female, and to have known or seen a classmate who was ill. It was the placebo effect on a grand scale, says psychologist Irving Kirsch at the University of Hull in the UK. "There was, as far as we can tell, no environmental toxin, but people began to feel ill."

Kirsch thinks that seeing a classmate develop symptoms shaped expectancies of illness in other children, triggering mass psychogenic illness. Outbreaks occur all over the world. In Jordan in 1998, 800 children apparently suffered side effects after a vaccination and 122 were admitted to hospital, but no problem was found with the vaccine. *Helen Pilcher is a science writer based in the UK*

## **Chemist Shows How RNA Can Be the Starting Point for Life**

**By NICHOLAS WADE**

An English chemist has found the hidden gateway to the RNA world, the chemical milieu from which the first forms of life are thought to have emerged on earth some 3.8 billion years ago.

He has solved a problem that for 20 years has thwarted researchers trying to understand the origin of life — how the building blocks of RNA, called nucleotides, could have spontaneously assembled themselves in the conditions of the primitive earth. The discovery, if correct, should set researchers on the right track to solving many other mysteries about the origin of life. It will also mean that for the first time a plausible explanation exists for how an information-carrying biological molecule could have emerged through natural processes from chemicals on the primitive earth.

The author, John D. Sutherland, a chemist at the University of Manchester, likened his work to a crossword puzzle in which doing the first clues makes the others easier. "Whether we've done one across is an open question," he said. "Our worry is that it may not be right."

Other researchers say they believe he has made a major advance in prebiotic chemistry, the study of the natural chemical reactions that preceded the first living cells. "It is precisely because this work opens up so many new directions for research that it will stand for years as one of the great advances in prebiotic chemistry," Jack Szostak of the Massachusetts General Hospital wrote in a commentary in *Nature*, where the work is being published on Thursday.

Scientists have long suspected that the first forms of life carried their biological information not in DNA but in RNA, its close chemical cousin. Though DNA is better known because of its storage of genetic information, RNA performs many of the trickiest operations in living cells. RNA seems to have delegated the chore of data storage to the chemically more stable DNA eons ago. If the first forms of life were based on RNA, then the issue is to explain how the first RNA molecules were formed.

For more than 20 years researchers have been working on this problem. The building blocks of RNA, known as nucleotides, each consist of a chemical base, a sugar molecule called ribose and a phosphate group. Chemists quickly found plausible natural ways for each of these constituents to form from natural chemicals. But there was no natural way for them all to join together.

The spontaneous appearance of such nucleotides on the primitive earth “would have been a near miracle,” two leading researchers, Gerald Joyce and Leslie Orgel, wrote in 1999. Others were so despairing that they believed some other molecule must have preceded RNA and started looking for a pre-RNA world.

The miracle seems now to have been explained. In the article in *Nature*, Dr. Sutherland and his colleagues Matthew W. Powner and Béatrice Gerland report that they have taken the same starting chemicals used by others but have caused them to react in a different order and in different combinations than in previous experiments. They discovered their recipe, which is far from intuitive, after 10 years of working through every possible combination of starting chemicals.

Instead of making the starting chemicals form a sugar and a base, they mixed them in a different order, in which the chemicals naturally formed a compound that is half-sugar and half-base. When another half-sugar and half-base are added, the RNA nucleotide called ribocytidine phosphate emerges.

A second nucleotide is created if ultraviolet light is shined on the mixture. Dr. Sutherland said he had not yet found natural ways to generate the other two types of nucleotides found in RNA molecules, but synthesis of the first two was thought to be harder to achieve.

If all four nucleotides formed naturally, they would zip together easily to form an RNA molecule with a backbone of alternating sugar and phosphate groups. The bases attached to the sugar constitute a four-letter alphabet in which biological information can be represented.

“My assumption is that we are here on this planet as a fundamental consequence of organic chemistry,” Dr. Sutherland said. “So it must be chemistry that wants to work.”

The reactions he has described look convincing to most other chemists. “The chemistry is very robust — all the yields are good and the chemistry is simple,” said Dr. Joyce, an expert on the chemical origin of life at the Scripps Research Institute in La Jolla, Calif.

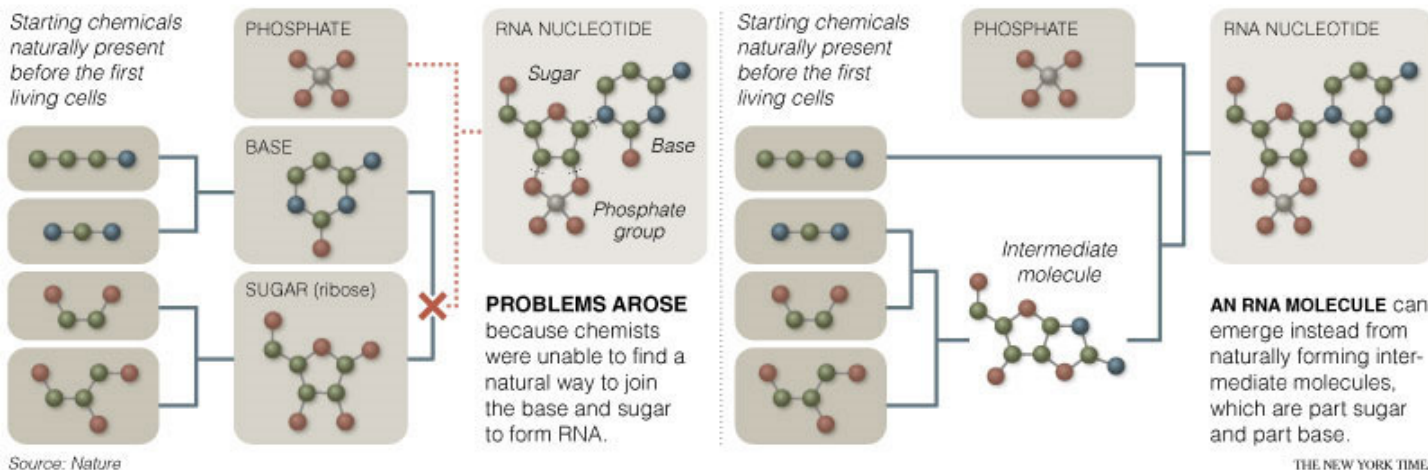
In Dr. Sutherland’s reconstruction, phosphate plays a critical role not only as an ingredient but also as a catalyst and in regulating acidity. Dr. Joyce said he was so impressed by the role of phosphate that “this makes me think of myself not as a carbon-based life form but as a phosphate-based life form.”

## Reconstructing the Chemistry of Early Life

An English chemist has discovered how RNA, a building block of living cells, may have emerged from chemicals naturally present on earth’s surface.

**PREVIOUS ATTEMPTS** to explain RNA’s formation have focused on its three components: a phosphate group, a base and a sugar molecule.

**THE NEW MODEL** uses the same starting chemicals, but combines them in a different order, avoiding the base and sugar molecules.



Dr. Sutherland’s proposal has not convinced everyone. Dr. Robert Shapiro, a chemist at New York University, said the recipe “definitely does not meet my criteria for a plausible pathway to the RNA world.” He said that cyano-acetylene, one of Dr. Sutherland’s assumed starting materials, is quickly destroyed by other chemicals and its appearance in pure form on the early earth “could be considered a fantasy.”

Dr. Sutherland replied that the chemical is consumed fastest in the reaction he proposes, and that since it has been detected on Titan there is no reason it should not have been present on the early earth.

If Dr. Sutherland’s proposal is correct it will set conditions that should help solve the many other problems in reconstructing the origin of life. Darwin, in a famous letter of 1871 to the botanist Joseph Hooker, surmised that life began “in some warm little pond, with all sorts of ammonia and phosphoric salts.” But the warm little pond has given way in recent years to the belief that life began in some exotic environment like the fissures of a volcano or in the deep sea vents that line the ocean floor.



Dr. Sutherland's report supports Darwin. His proposed chemical reaction take place at moderate temperatures, though one goes best at 60 degrees Celsius. "It's consistent with a warm pond evaporating as the sun comes out," he said. His scenario would rule out deep sea vents as the place where life originated because it requires ultraviolet light.

A serious puzzle about the nature of life is that most of its molecules are right-handed or left-handed, whereas in nature mixtures of both forms exist. Dr. Joyce said he had hoped an explanation for the one-handedness of biological molecules would emerge from prebiotic chemistry, but Dr. Sutherland's reactions do not supply any such explanation. One is certainly required because of what is known to chemists as "original syn," referring to a chemical operation that can affect a molecule's handedness.

Dr. Sutherland said he was working on this problem and on others, including how to enclose the primitive RNA molecules in some kind of membrane as the precursor to the first living cell.

### Did you know?

For centuries experts have argued over how the giraffe got its long neck.

Some said it helped the giraffe feed on leaves other animals cannot, while some suggested it evolved as a consequence of giraffes evolving long legs. But evidence for such ideas remains flimsy. Now one of the more recent hypotheses has also bitten the dust.

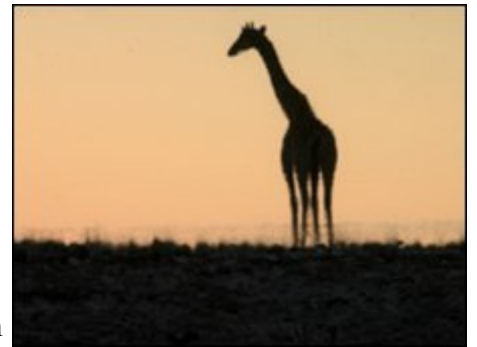
Giraffes did not grow elaborately long necks as a sexual signal, scientists have shown, leaving its origins a mystery.

In the journal *Zoology*, Professor Graham Mitchell of the University of Wyoming, in Laramie, US, and colleagues Professor John Skinner and Dr S J van Sittert of the University of Pretoria in South Africa report that there is still no consensus on the origin of the giraffe's neck.

The theory which most support, they say, is that the neck confers a feeding advantage, allowing the giraffe to reach leaves beyond more numerous smaller browsers such as gazelles or antelope.

Research has shown that having a long neck does confer an advantage when the lower leaves of trees have already been eaten, while it also helps giraffes reach more inaccessible leaves in the centre of low trees. But giraffes tend to prefer particular types of leaves rather than leaves at particular heights, suggesting that competition for different leaves may not have naturally selected strongly for longer necks.

Another hypothesis is that giraffes evolved longer legs to run away from predators and needed an equally long neck to reach the ground to drink.



*What benefit is such a neck?*

### Sexually attractive?

More recently, another popular idea emerged: that sexual selection, rather than natural selection, drove the evolution of the giraffe's neck. The idea is that down the generations, males evolved ever longer necks to dominate rivals for the affections of female giraffes. The fact the male giraffes uniquely wrestle for dominance by "necking" and "head clubbing" one another, with males with the longest necks and heaviest heads tending to win, has been forwarded as evidence to support the hypothesis.

So Professor Mitchell and his colleagues decided to put the sexual selection hypothesis to the test by examining 17 male and 21 female giraffes.

If long necks were a sexually selected trait, they expected to find a number of things:

- \* Long necks should be more exaggerated in males than females
- \* They should evolve to be bigger in size more than other parts of a giraffe's body
- \* They should confer no immediate benefit to survival, and may come at a cost

Their results didn't support any of these propositions. They could find no significant differences in the relative size of male or female necks. What's more, although giraffes do invest more in growing their necks than other body parts as they grow, both sexes do so equally. And there is little evidence that a large neck is costly to male giraffes, as generally male giraffes are no more vulnerable to predators than females.

It will never be possible to conclusively prove what advantages selected for longer necked giraffes, say the researchers.

But they can say that any advantages that were gained don't appear to have been sexual in nature. "Better explanations for neck elongation must be sought elsewhere," they write.

## **Heating heart with catheter better than drugs for common heart rhythm disorder** **Catheter ablation effective for atrial fibrillation**

MAYWOOD, IL. -- Treating a common heart rhythm disorder by burning heart tissue with a catheter works dramatically better than drug treatments, a major international study has found.

One year after undergoing a treatment called catheter ablation, 63 percent of patients with an irregular heartbeat called atrial fibrillation were free of any recurrent atrial arrhythmias or symptoms. By comparison, only 17 percent of those treated with drugs were arrhythmia-free. Results were so convincing the trial was halted early. The ablation group also scored significantly higher on a quality-of-life scale.

The study included 167 patients at 19 centers, including 15 centers in the United States. Lead researcher Dr. David Wilber presented results at Heart Rhythm 2009, the Society's 30th Annual Scientific Sessions. Wilber is director of the Cardiovascular Institute at Loyola University Stritch School of Medicine in Maywood, IL. Atrial fibrillation, often called A-Fib, is the most common form of irregular heartbeat. Electrical signals, which regulate the heartbeat, become erratic. Instead of beating regularly, the upper chambers of the heart quiver. Not all the blood gets pumped out, so clots can form. Atrial fibrillation can lead to strokes and heart failure.

A-Fib patient Robin Drabant, 35, of Hanover Park, IL., said the condition once "made me feel like I was 90 years old with a failing heart." She was on a maximum dose of an A-Fib medication, which caused fatigue. Despite the drug, she still had episodes almost every day, lasting from 10 seconds to an hour or longer. "I would lose my breath and could feel my heart racing and fluttering," she said.

Wilber performed a catheter ablation on Drabant in May, 2008, and she no longer has A-Fib episodes. "I had great results," she said.

A-Fib symptoms include heart palpitations, dizziness, fatigue, shortness of breath and fainting. "A lot of people are disabled," Wilber said. "They have no energy. They can't work. They have a very poor quality of life."

More than 2 million Americans have atrial fibrillation, and there are about 160,000 new cases each year. The number is increasing, due in part to the aging population and the obesity epidemic.

Drugs such as beta blockers and calcium channel blockers can slow the heart rate during an A-Fib episode. Other drugs such as flecainide and propafenone can help maintain a normal rhythm. When drugs don't work or produce unacceptable side effects, alternative treatments include a pacemaker, surgery and catheter ablation.

In the ablation procedure, an electrophysiologist destroys small areas of heart tissue that are responsible for the erratic electrical signals. A catheter (thin flexible tube) is guided through blood vessels to the heart. The tip of the catheter delivers radiofrequency energy that heats and destroys tissue. Possible adverse effects include irritation of the lining of the heart, fluid in the lungs or around the heart, bleeding, clots and stroke.

In the study, 106 patients with frequent episodes of atrial fibrillation were randomly assigned to undergo ablation and 61 similar patients were randomly assigned to receive drug therapy. All patients had experienced at least three episodes of atrial fibrillation during the previous six months and had failed at least one attempt to control the rhythm with drugs.

The study was funded by Biosense Webster, which makes the ThermoCool catheter used in the trial. Wilber is a consultant to the company.

The study was the largest to date to compare ablation to drug therapy for atrial fibrillation. Earlier studies involved single centers and smaller sample sizes, Wilber said. An additional study called CABANA is designed to determine whether ablation patients live longer than patients receiving medication. Researchers will follow about 3,000 patients for three years.

*Heart Rhythm 2009 takes place May 13-16 at the Boston Exhibition and Convention Center. The meeting is the most comprehensive educational event on heart rhythm disorders, offering approximately 250 educational opportunities in multiple formats. The world's most renowned scientists and physicians will present a wide range of heart rhythm topics, including cardiac resynchronization therapy, catheter ablation, cardiac pacing and heart failure, as well as the latest technology, including state-of-the-art pacemakers and defibrillators. [www.HRSONline.org](http://www.HRSONline.org).*

## **Ginger quells cancer patients' nausea from chemotherapy**

People with cancer can reduce post-chemotherapy nausea by 40 percent by using ginger supplements, along with standard anti-vomiting drugs, before undergoing treatment, according to scientists at the University of Rochester Medical Center.

About 70 percent of cancer patients who receive chemotherapy complain of nausea and vomiting. "There are effective drugs to control vomiting, but the nausea is often worse because it lingers," said lead author Julie L. Ryan, Ph.D., M.P.H., assistant professor of Dermatology and Radiation Oncology at Rochester's James P. Wilmot Cancer Center. The research will be presented at the American Society of Clinical Oncology meeting in the Patient and Survivor Care Session on Saturday, May 30, in Orlando, Fla.

"Nausea is a major problem for people who undergo chemotherapy and it's been a challenge for scientists and doctors to understand how to control it," said Ryan, a member of Rochester's Community Clinical Oncology Program Research Base at the Wilmot Cancer Center. Her research is the largest randomized study to demonstrate the effectiveness of ginger supplements to ease the nausea. Previous small studies have been inconsistent and never focused on taking the common spice before chemotherapy.

The Phase II/III placebo-controlled, double-blind study included 644 cancer patients who would receive at least three chemotherapy treatments. They were divided into four arms that received placebos, 0.5 gram of ginger, 1 gram of ginger, or 1.5 grams of ginger along with antiemetics (anti-vomiting drugs such as Zofran®, Kytril®, Novaban®, and Anzemet®.)

Patients took the ginger supplements three days prior to chemotherapy and three days following treatment. Patients reported nausea levels at various times of day during following their chemotherapy and those who took the lower doses had a 40 percent reduction.

Ginger is readily absorbed in the body and has long been considered a remedy for stomach aches. "By taking the ginger prior to chemotherapy treatment, the National Cancer Institute-funded study suggests its earlier absorption into the body may have anti-inflammatory properties," Ryan said.

*Rochester's Community Clinical Oncology Program Research Base is a national cooperative research group funded by the National Cancer Institute. The Wilmot Cancer Center team specializes in improving the quality of life of people who have cancer.*

## **French software and Dutch national Supercomputer Huygens establish a new world record in Go**

### ***A new world record in Go established by PRACE prototype and French software***

At the Taiwan Open 2009, held in Taiwan from February 10-13, the Dutch national supercomputer Huygens, which is located at SARA Computing and Networking Services in Amsterdam, defeated two human Go professionals in an official match. This is the second victory of Huygens playing Go against professional players. During the first two days of the event, the Go program MoGo TITAN sets two new world records by winning a 19x19 competition with a 7-stones handicap against the 9P dan professional Go player Jun-Xun Zhou, and a 19x19 competition with a 6-stones handicap against the 1P dan professional Go player Li-Chen Chien.

The first victory of the Huygens supercomputer was achieved in August 2008 at the 24th Annual Congress of the Go competition, held in Portland, Oregon when the 8P dan human Go professional Kim MyungWan was defeated in an official match with a 9-stones handicap.

After the victory of IBM's Deep Blue against Garry Kasparov, the game of Go has replaced chess as a test bed for research in artificial intelligence (AI). Go is one of the last board games where humans are still able to easily win against AI. Although there has been quite some research in the Go domain for 40 years, the progress in Computer Go has been slow. However, researchers have discovered new performing algorithms and computers are catching up really fast. Since 2006, when a new algorithm called Monte-Carlo Tree Search was proposed, the level of Go programs has improved drastically. The application 'MoGo TITAN', developed by INRIA France and Maastricht University, runs on the Dutch national supercomputer Huygens, which is one of the PRACE prototypes.

The French partners are Tao, INRIA, CNRS, LRI, Université Paris-Sud, Grid5000 with "top" contributors Jean-Baptiste Hoock, Arpad Rimmel and Olivier Teytaud. Top contributor for the Maastricht University was Guillaume Chaslot. Other contributors were Christophe Fiter, Sylvain Gelly, Julien Perez, Yizao Wang. The games were organized mainly by Chang-Shing Lee and MeiHui Wang, National University of Tainan (Taiwan). Dr. Anwar Osseyran, SARA Managing Director: "This new milestone in AI research once again clearly demonstrates the great potential of Huygens in many non-traditional areas of usage of Supercomputing."

### **Financers**

The research in this project has been financed through the GoForGo project by the Physical Sciences council of the Netherlands Organisation for Scientific Research (NWO) and by the French financers Tao, INRIA, CNRS, LRI, Université Paris-Sud, while the CPU hours of Huygens were granted by the Netherlands National Computing Facilities Foundation (NCF).

Dr. Patrick Aerts, NCF Director: "One of NCF's aims is to facilitate all scientific research disciplines which can benefit from High Performance Computing (HPC). Apart from traditional areas as computational fluid dynamics and theoretical chemistry, it is encouraging to see that more and more other areas, like AI, explore the opportunities offered by HPC for their research fields."

### **System**

Huygens, an IBM Power 575 Hydro-Cluster system, is the national supercomputer and located at SARA Computing and Networking Services in Amsterdam. The system, which is in production since August 2008, has

a peak speed of 60 trillion calculations per second (Teraflop/s), 3328 Power6 processor cores at 4.7 GHz, a total memory capacity of more than 15 TB, and almost 1,000 TB disk capacity.

The PRACE project has identified several prototype architectures, which will be assessed within the project. The Huygens system is one of these prototype architectures.

### **Achieving Fame, Wealth, and Beauty are Psychological Dead Ends, Study Says**

If you think having loads of money, fetching looks, or the admiration of many will improve your life — think again. A new study by three University of Rochester researchers demonstrates that progress on these fronts can actually make a person less happy.

"People understand that it's important to pursue goals in their lives and they believe that attaining these goals will have positive consequences. This study shows that this is not true for all goals," says author Edward Deci, professor of psychology and the Gowen Professor in the Social Sciences at the University. "Even though our culture puts a strong emphasis on attaining wealth and fame, pursuing these goals does not contribute to having a satisfying life. The things that make your life happy are growing as an individual, having loving relationships, and contributing to your community," Deci says.

The research paper, to be published in the June issue of the *Journal of Research in Personality*, tracked 147 alumni from two universities during their second year after graduation. Using in-depth psychological surveys, the researchers assessed participants in key areas, including satisfaction with life, self-esteem, anxiety, physical signs of stress, and the experience of positive and negative emotions.

Aspirations were identified as either "intrinsic" or "extrinsic" by asking participants how much they valued having "deep, enduring relationships" and helping "others improve their lives" (intrinsic goals) versus being "a wealthy person" and achieving "the look I've been after" (extrinsic goals). Respondents also reported the degree to which they had attained these goals. To track progress, the survey was administered twice, once a year after graduation and again 12 months later.

This post-graduation period was selected because it is typically a critical developmental juncture for young adults, explains lead author Christopher Niemiec, a doctoral candidate in psychology at the University. "During this formative period, graduates are no longer in the home or at the university. For the first time, they are in a position to determine for themselves how they want their lives to proceed."

As with earlier research, the study confirmed that the more committed an individual is to a goal, the greater the likelihood of success. But unlike previous findings, this analysis showed that getting what one wants is not always salubrious. "There is a strong tradition in psychology that says if you value goals and attain them, wellness will follow," says Niemiec. "But these earlier studies did not consider the content of the goals."

What's "striking and paradoxical" about this research, he says, is that it shows that reaching materialistic and image-related milestones actually contributes to ill-being; despite their accomplishments, individuals experience more negative emotions like shame and anger and more physical symptoms of anxiety such as headaches, stomachaches, and loss of energy. By contrast, individuals who value personal growth, close relationships, community involvement, and physical health are more satisfied as they meet success in those areas. They experience a deeper sense of well-being, more positive feelings toward themselves, richer connections with others, and fewer physical signs of stress.

The findings in this study support Self-Determination Theory, a well-established theory of human motivation developed by two of the paper's authors, Deci and fellow University psychologist Richard Ryan. The theory holds that well-being depends in large part on meeting one's basic psychological needs for autonomy, competence, and relatedness.

Intrinsic aspirations make people happy because they fulfill these foundational needs, conclude the authors. "Intrinsic aspirations seem to be more closely related to the self, to what's inside the self, rather than to what's outside the self," Niemiec explains.

Striving for wealth and adulation, on the other hand, does little to satisfy these deep human requirements, at least within this early career stage of life. In addition, this was a well-educated sample, and the authors stress the need for research in other demographics and age ranges. Yet for this young adult group, the authors suggest that time devoted to extrinsic pursuits, like working long hours, often crowds out opportunities for psychologically nourishing experiences, such as relaxing with friends and family or pursuing a personal passion. Craving money and adoration also can lead to a preoccupation with "keeping up with the Joneses"—upward social comparisons that breed feelings of inadequacy and jealousy. And unlike the lasting benefits of caring relationships and hard-earned skills, the thrill of extrinsic accomplishments fade quickly; all too soon, the salary raise is a distant memory and the rave review forgotten.

*The research was supported in part by a grant from the National Institute of Mental Health.*

## Genital stimulation opens door for cryptic female choice in tsetse flies

By snipping off parts of male genitalia and reducing genital sensation in both male and female tsetse flies, researchers induced a suite of changes in female reproduction, including reduced ovulation, reduced sperm storage and increased re-mating attempts by the females. "To the best of our knowledge, this was the first study to look at female choice following experimental manipulation of both male and female genitalia," said William Eberhard, staff scientist at the Smithsonian Tropical Research Institute and professor of biology at the University of Costa Rica.

Cryptic female choice - the ability of females to control which sperm reaches their eggs during and after the mating process - leads to rapid evolutionary changes in genital structure and is probably influenced by the number of times a female mates with different males.



*Genital stimulation affects a wide variety of female reproductive behaviors with important evolutionary implications.*

Bill Eberhard, STRI

"The tsetse fly Kama Sutra is long and elaborate," said Eberhard, who described the 30-minute ritual during which the male rubs the underside of the female's abdomen with his hind legs, sings to her by buzzing his wings, rubs her eyes with his front legs, and so on.

With Daniel Briceño, professor of biology at the University of Costa Rica, Eberhard modified male genital structures by cutting off a tooth that is typical of this species of tsetse fly and by smoothing a bristly surface by applying a coat of nail polish. In addition, they modified the sensations perceived by the female from these structures by altering the female sense organs on the portions of her body that these male structures contact during copulation. "We were surprised by the number of female processes that were influenced by modifying the stimuli received by the female from the male's genitalia," said Eberhard.

Immunotherapy effective against neuroblastoma in children

## New therapy improves chances of living disease-free with difficult-to-treat childhood cancer

A phase III study has shown that adding an antibody-based therapy that harnesses the body's immune system resulted in a 20 percent increase in the number of children living disease-free for at least two years with neuroblastoma. Neuroblastoma, a hard-to-treat cancer arising from nervous system cells, is responsible for 15 percent of cancer-related deaths in children. The researchers reported their findings – the first to show that immunotherapy could be effective against childhood cancer – online May 14, 2009 on the American Society of Clinical Oncology website in advance of presentation June 2.

"This establishes a new standard of care for a traditionally very difficult cancer in children," said lead author Alice Yu, MD, PhD, professor of pediatric hematology/oncology at the University of California, San Diego School of Medicine and the Moores UCSD Cancer Center. "High-risk neuroblastoma has always been a frustrating cancer to treat because, despite aggressive therapy, it has a high relapse rate."

The therapy targets a specific glycan (a complex sugar chain found on the surface of cells) on neuroblastoma cells called GD2, which inhibit the immune system from killing cancer cells. The antibody – ch14.18 – binds to this glycan, enabling various types of immune cells to attack the cancer.

Neuroblastoma – in which the cancer cells arise from nerve cells in the neck, chest, or abdomen – is the most common cancer diagnosed in the first year of life. Approximately 650 new cases of neuroblastoma are diagnosed in this country every year, and about 40 percent of patients have high-risk neuroblastoma. These high-risk patients are usually treated with surgery, intensive chemotherapy with stem cell rescue (in which patients' adult stem cells, removed before treatment, are returned after chemotherapy to restore the blood and immune system), and radiation therapy. Still, only 30 percent of patients survive.

Yu and her colleagues compared both the percentage of patients who were still alive without experiencing a recurrence after two years as well as overall survival in two groups of 113 patients each. Patients began the trial when they were newly diagnosed with high-risk neuroblastoma. After conventional treatment with surgery, chemotherapy, stem cell rescue and radiotherapy, one group was given the standard treatment (retinoic acid) plus immunotherapy (the antibody plus immune-boosting substances), while 113 similar patients received the standard treatment alone.

After two years, 66 percent of individuals in the immunotherapy group were living free of cancer compared to 46 percent in the standard treatment group. Overall survival improved significantly as well. The trial patient randomization was halted early because of the benefit seen, and all patients enrolled in the trial will receive immunotherapy plus standard treatment.

Yu noted that the two-year mark is especially important because past trials have shown that those neuroblastoma patients who live without disease for two years after a stem cell transplant will most likely be cured. "This is the first time in many years that we have been able to improve the 'cure rate' for neuroblastoma patients," she said. "This new therapy can help us improve care and perhaps offer new hope to many patients and families."

Yu and her team conducted the early phase I and phase II trials at the General Clinical Research Center at UC San Diego Medical Center.

*Other co-authors include Andrew Gilman, Carolinas Medical Centre; M. Fevzi Ozkaynak, New York Medical College; Susan Cohn, University of Chicago; John Maris, Children's Hospital of Philadelphia; Paul Sondel, University of Wisconsin; W. B. London, University of Florida; S. Kreissman, Duke University; H.X. Chen, National Cancer Institute; and K.K. Matthay, UCSD. Local patients were seen in San Diego at Rady Children's Hospital.*

### **Study finds virtual doctors visits satisfactory for both patients and clinicians**

BOSTON – Travelers book plane tickets online, bank customers can check their accounts at any computer, and busy families can grocery shop online. Someday, even doctor visits could be among the conveniences offered via the Internet. Researchers considering the feasibility and effectiveness of virtual doctors visits report that patients and physicians found that evaluations done through videoconferencing were similar to face-to-face visits on most measures, according a study published in the May issue of the Journal of Telemedicine and Telecare.

"There is growing evidence that the use of videoconferencing in the medical environment is useful for a variety of acute and chronic issues," says Ronald F. Dixon, MD, an internist at Massachusetts General Hospital and the study's senior author. "Videoconferencing between a provider and patients allows for the evaluation of many issues that may not require an office visit and can be achieved in a shorter time."

The healthcare delivery model in the United States is under scrutiny. Reduced access to providers, rapidly increasing costs and an aging population represent major challenges for the healthcare system. Telemedicine projects, including virtual visits (a patient-physician real-time encounters using videoconferencing technology) are being examined to evaluate their capacity to improve patient access to care and lower healthcare costs.

This study, the largest trial of virtual visits versus face-to-face visits done to date, randomized patients to one of two arms. In the first arm, the patients completed a visit (virtual or face-to-face) with a physician; they then completed a second visit via the other modality with another physician. In the second arm of the study, subjects had both visits face-to-face with two different physicians. All physicians and patients completed evaluation questionnaires after each visit.

Patients found virtual visits similar to face-to-face visits on most measures, including time spent with the physician, ease of interaction and personal aspects of the interaction. Physicians scored virtual visits similar to face-to-face visits on measures including history taking and medication dispensing. Though they were less satisfied on measures of clinical skill and overall satisfaction, those ratings were still in the good to excellent range.

The diagnostic agreement between physicians was 84 percent between face-to-face and virtual visits; it was 80 percent between the two face-to-face visits.

"The tradition of medicine is to lay hands on the patients, which has always been considered paramount to patient care in the minds of physicians," says Dixon. "However, these findings suggest that virtual visits could be a viable option in circumstances where patients need to be monitored routinely for chronic conditions like diabetes, hypertension, obesity or depression, and where self-management strategies are not working. Virtual visits may also be effective for triage of acute, non-urgent issues like back pain or respiratory infections."

Among the benefits of virtual visits are reduce overhead costs for a physicians' practices by reducing the space and resource requirements. For patients, a virtual visit can minimize time taken away from work and transportation costs. The study suggests that both patients and physicians could benefit if virtual visits were used as an alternative method of accessing primary care.

*The co-author of this study is James E. Stahl, MD, internist and technology adoption researcher at Massachusetts General Hospital. The study was supported by the Center for the Innovation of Medicine and Innovative Technology (CIMIT) and the MGH Department of Medicine.*

### **Veterinarians at high risk for viral, bacterial infections from animals**

The recent H1N1 influenza epidemic has raised many questions about how animal viruses move to human populations. One potential route is through veterinarians, who, according to a new report by University of Iowa College of Public Health researchers, are at markedly increased risk of infection with zoonotic pathogens -- the viruses and bacteria that can infect both animals and humans.

While there is no evidence that veterinarians played a direct role in the current H1N1 epidemic, the review found that veterinarians can serve as a "bridging population," spreading pathogens to their families, their communities and the various groups of animals for which they provide care. The paper appears in the May 15 issue of the Journal of the American Veterinary Medical Association (<http://avmajournals.avma.org/loi/javma>). While conducting previous occupational research studies, the study's authors, Whitney Baker, a doctoral student in epidemiology at the University of Iowa College of Public Health, and Gregory Gray, M.D., University of Iowa professor of epidemiology and director of the University of Iowa Center for Emerging Infectious Diseases, observed that veterinarians often have evidence of zoonotic influenza virus infection. To better understand this finding, Baker and Gray conducted a review of medical literature published between 1966 and 2007 and identified 66 journal articles that specifically addressed veterinarians and zoonotic infections.

"Our review of the literature found that veterinarians' risk of zoonotic infections is often higher than that of other occupational groups with extensive exposure to animals, such as farm workers," Baker said. "This is remarkable since veterinarians have professional training in how to protect themselves from zoonotic infections."

The review found veterinarians had an increased risk for various pathogens, including swine influenza, avian influenza and swine hepatitis E viruses; Brucella; Coxiella burnetii; avian and feline Chlamydia psittaci; methicillin-resistant Staphylococcus aureus; and Bartonella bacteria. Additionally, the review provided evidence that veterinarians could be infected with animal pathogens that are not widely recognized as zoonotic.

"It has been estimated that the majority of more than 1,400 recognized human diseases are zoonotic and that more than 70 percent of 177 emerging or reemerging diseases have originated in animals," Gray said. "We can expect the majority of newly emergent human pathogens to similarly originate from animals. Clearly, there is a critical need to better understand pathogen transmission from animals to man and from man to animals."

Baker and Gray also analyzed seven published surveys that focused on veterinarians' self-reported use of protective equipment. These reports indicate that veterinarians often fail to routinely use recommended personal protective equipment, such as gloves, gowns and respiratory protection devices.

In conversations with veterinarians, the authors learned that veterinarians may neglect to wear protective gear because of discomfort, lack of availability, cost and the belief that there is a low risk of zoonotic infection.

The authors suggest that professional and policy measures should be implemented to reduce hazards for veterinarians, which could help prevent transmission of zoonotic infections to other human and animal groups. Current national policies in place to prevent an influenza pandemic often overlook veterinarians. Based on their review, Baker and Gray believe these standards need to change.

"Veterinarians play a vital role in biopreparedness, yet they do not seem to get much respect," Gray said. "We need to appreciate their many contributions, offer them special training, and support them with public health policy measures. For instance, veterinarians who work with swine and poultry should be included as a high-priority group for receipt of annual influenza and pandemic influenza vaccines. Doing so will help to protect them, their families and our nation."

Baker and Gray's review focused on literature and surveys published in the United States and internationally; however, their review may not represent all veterinarians as the scientific reports were predominantly from English-speaking and developed countries. Internationally, the authors noted, there are major differences between zoonotic disease prevalence, the quality of veterinary education and the availability of protective resources.

"To really make a difference in controlling emerging infectious diseases, we need to think globally and develop measures that protect veterinarians here and abroad," Baker said.

Study makes first connection between heart disorder and Alzheimer's disease

### **Study of more than 37,000 patients shows relationship between atrial fibrillation and development of Alzheimer's disease**

Researchers at Intermountain Medical Center in Salt Lake City believe that they have made a breakthrough connection between atrial fibrillation, a fairly common heart rhythm disorder, and Alzheimer's disease, the leading form of dementia among Americans.

In a study presented Friday, May 15, at "Heart Rhythm 2009," the annual scientific sessions of the Heart Rhythm Society in Boston, researchers unveiled findings from the study of more than 37,000 patients that showed a strong relationship between atrial fibrillation and the development of Alzheimer's disease.

The study, which drew upon information from the Intermountain Heart Collaborative Study, a vast database from hundreds of thousands of patients treated at Intermountain Healthcare hospitals, found:

- Patients with atrial fibrillation were 44 percent more likely to develop dementia than patients without the heart disorder.
- Younger patients with atrial fibrillation were at higher risk of developing all types of dementia, particularly Alzheimer's. Atrial fibrillation patients under age 70 were 130 percent more likely to develop Alzheimer's.
- Patients who have both atrial fibrillation and dementia were 61 percent more likely to die during the study period than dementia patients without the rhythm problem.
- Younger atrial fibrillation patients with dementia may be at higher risk of death than older AF patients with dementia.

Intermountain Medical Center cardiologist T. Jared Bunch, M.D., the study's lead researcher, presented the findings at the scientific session.

"Previous studies have shown that patients with atrial fibrillation are at higher risk for some types of dementia, including vascular dementia. But to our knowledge, this is the first large-population study to clearly show that having atrial fibrillation puts patients at greater risk for developing Alzheimer's disease," said Dr. Bunch.

Alzheimer's is a devastating brain disease affecting approximately 5.3 million Americans. It is the most common form of dementia (a general term for life-altering loss of memory and other cognitive abilities), and accounts for 60-80 percent of all dementia cases. Today, it is the sixth leading cause of death in the United States.

Currently, the known risk factors for Alzheimer's are age, family history and genetics, though injury may also be linked with the disease. Heart health has long been suspected to play a role, but has not been linked. The Intermountain Medical Center study bolsters that connection.

"The study shows a connection between atrial fibrillation and all types of dementia," said Bunch. "The Alzheimer's findings — particularly the risk of death for younger patients — break new ground."

Atrial fibrillation is the most common heart rhythm problem, affecting about 2.2 million Americans. It occurs when the heart beats chaotically, leading blood to pool and possibly clot. If the clot leaves the heart, a stroke can result.

The Intermountain Medical Center study looked at five years of data for 37,025 patients. Of that group, 10,161 developed AF and 1,535 developed dementia during the study period.

The study authors say more research is needed to explore further the relationship between atrial fibrillation and the development of Alzheimer's disease.

"Now that we've established this link, our focus will be to see if early treatment of atrial fibrillation can prevent dementia or the development of Alzheimer's disease," says cardiologist John Day, M.D., director of heart rhythm services at Intermountain Medical Center and a co-author of the study.

### **Researchers closer to the ultimate green 'fridge magnet'**

Scientists are a step closer to making environmentally-friendly 'magnetic' refrigerators and air conditioning systems a reality, thanks to new research published today in *Advanced Materials*.

Magnetic refrigeration technology could provide a 'green' alternative to traditional energy-guzzling gas-compression fridges and air conditioners. They would require 20-30% less energy to run than the best systems currently available, and would not rely on ozone-depleting chemicals or greenhouse gases. Refrigeration and air conditioning units make a major contribution to the planet's energy consumption - in the USA in the summer months they account for approximately 50% of the country's energy use.

A magnetic refrigeration system works by applying a magnetic field to a magnetic material - some of the most promising being metallic alloys - causing it to heat up. This excess heat is removed from the system by water, cooling the material back down to its original temperature. When the magnetic field is removed the material cools down even further, and it is this cooling property that researchers hope to harness for a wide variety of cooling applications.

The technology, based on research funded in the UK by the Engineering and Physical Sciences Research Council (EPSRC), has proved possible in the lab but researchers are still looking for improved materials that provide highly efficient cooling at normal room temperatures, so that the technology can be rolled out from the lab to people's homes and businesses.

They need a material that exhibits dramatic heating and cooling when a magnetic field is applied and removed, which can operate in normal everyday conditions, and which does not lose efficiency when the cooling cycle is repeated time after time.

The new study published today shows that the pattern of crystals inside different alloys - otherwise known as their microstructure - has a direct effect on how well they could perform at the heart of a magnetic fridge. The



Imperial College London team behind the new findings say this could, in the future, help them to custom-design the best material for the job.

Professor Lesley Cohen, one of the authors of the paper, explains that by using unique probes designed at Imperial, her team, led by Dr James Moore, was able to analyse what happens to different materials on a microscopic level when they are magnetised and de-magnetised. This enabled the team to pinpoint what makes some materials better candidates for a magnetic fridge system than others.

Professor Cohen, from Imperial's Department of Physics, said: "We found that the structure of crystals in different metals directly affects how dramatically they heat up and cool down when a magnetic field is applied and removed. This is an exciting discovery because it means we may one day be able to tailor-make a material from the 'bottom up', starting with the microstructure, so it ticks all the boxes required to run a magnetic fridge. This is vitally important because finding a low-energy alternative to the fridges and air conditioning systems in our homes and work places is vital for cutting our carbon emissions and tackling climate change."

This new research follows on from another study published by the same Imperial group in *Physical Review B* last month, in which they used similar probing techniques to precisely measure the temperature changes that occur when different materials are removed from a magnetic field, and to analyse the different ways they occur.

The lead scientist Kelly Morrison found that at the molecular level two different temperature change processes, known as first- and second-order changes, happen simultaneously in each material. The team think that the extent to which each of these two processes feature in a material also affects its cooling capabilities.

Professor Cohen says this means that whilst the majority of research to perfect magnetic refrigeration worldwide has tended to involve analysing and testing large samples of materials, the key to finding a suitable material for everyday applications may lie in the smaller detail:

"Our research illustrates the importance of understanding the microstructure of these materials and how they respond to magnetic fields on a microscopic level," she concluded.

*The research was carried out in collaboration with the Ames Laboratory, USA.*

## **Chernobyl fallout could drive evolution of 'space plants'**

\* 12:06 15 May 2009 by Ewen Callaway

More than two decades after the world's largest nuclear disaster, life around Chernobyl continues to adapt.

"There are no dogs with two heads," says Martin Hajduch of the Slovak Academy of Sciences – although birds, insects and humans have all been affected to a greater or lesser extent by radioactive fallout.

To determine how plants might have adapted to the meltdown, Hajduch's team compared soya grown in radioactive plots near Chernobyl with plants grown about 100 kilometres away in uncontaminated soil.

Compared to the plants grown in normal soil, the Chernobyl soya produced significantly different amounts of several dozen proteins, the team found. Among those are proteins that contribute to the production of seeds, as well as proteins involved in defending cells from heavy metal and radiation damage. "One protein is known to actually protect human blood from radiation," Hajduch says.

For this study, his team looked at just the first generation of soya grown in Chernobyl soil, but they plan to examine a second generation of seeds. After the 1986 meltdown, it took plants several generations to fully adapt to the new conditions, Hajduch says.

Determining how plants coped with life after Chernobyl could help scientists engineer radiation-resistant plants, Hajduch says. While few farmers are eager to cultivate radioactive plots on Earth, future interplanetary travellers may need to grow crops to withstand space radiation.

*Journal reference: Journal of Proteome Research (DOI: 10.1021/pr900034u)*

## **Sardinians unlock 'sardonic grin'**

### ***Homer's death-defying laugh linked to island plant***

(ANSA) - Cagliari, May 15 - Sardinian scientists believe they've traced the roots of the 'death-defying' sardonic grin to a plant commonly found on the Italian island.

Greek poet Homer first used the word, an adaptation of the ancient word for Sardinian, to describe a defiant smile or laugh in the face of death. He was believed to have coined it because of the belief that the Punic people who settled Sardinia gave condemned men a potion that made them smile before dying.

The association with Sardinia has often been disputed, but Cagliari University botanists think they've settled the case - and the plant in question could have beneficial properties too.

The plant, tubular water-dropwort (*oenanthe fistulosa*), is common in Sardinia, where it is popularly known as 'water celery'.

"Our discovery supports what many cultural anthropologists have said about death rituals among the ancient Sardinians," said Cagliari University Botany Department chief Mauro Ballero.

"The Punics were convinced that death was the start of new life, to be greeted with a smile," he said.

Ballero's team, whose work appears in the latest edition of the US Journal of Natural Products, have established that a toxic substance in the dropwort plant does, in fact, cause facial muscles to contract and produce a grimace or rictus.

The discovery could have a brighter side, he said, leading to drugs that might help certain conditions where parts of the face are paralysed. "The good news is that the molecule in this plant may be retooled by pharmaceutical companies to have the opposite effect," he said.

## German Fossil Found to Be Early Primate

By JOHN NOBLE WILFORD

Fossil remains of a 47-million-year-old animal, found years ago in Germany, have been analyzed more thoroughly and determined to be an extremely early primate close to the emergence of the evolutionary branch leading to monkeys, apes and humans, scientists said in interviews this week.

Described as the "most complete fossil primate ever discovered," the specimen is a juvenile female the size of a small monkey. Only the left lower limb is missing, and the preservation is so remarkable that impressions of fur and the soft body outline are still clear. The animal's last meal, of fruit and leaves, remained in the stomach cavity.

In an article to be published on Tuesday in PLoS One, an online scientific journal, an international team of scientists will report that this extraordinary fossil could be a "stem group" from which higher primates evolved, "but we are not advocating this."

The researchers said the specimen, designated *Darwinius masillae*, "is important in being exceptionally well preserved and providing a much more complete understanding of the paleobiology" of a primate from the Eocene period, a time when primitive primates were starting to branch into two lineages, the prosimians and the anthropoids.

As part of a heavily promoted publicity campaign, the skeleton will be displayed at a news conference on Tuesday at the American Museum of Natural History in New York; the History Channel plans a documentary on the primate at 9 p.m. on May 25; and Little Brown is bringing out a book. The Wall Street Journal published an article on Friday giving some scientific details of the discovery.

The specimen was excavated by private collectors in 1983 from the Messel Shale Pit, a shale quarry near Darmstadt, Germany, that has yielded many fossils of Eocene life, including other primitive primates.

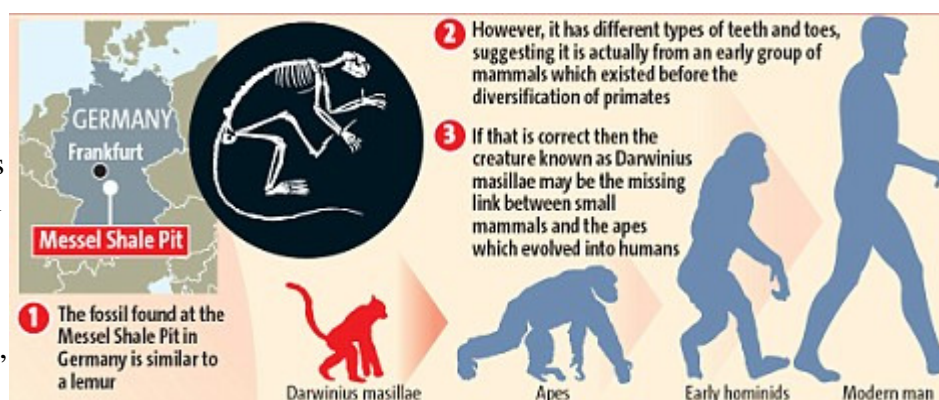
Jörn H. Hurum, a paleontologist at the University of Oslo and a leader of the research, said the site was "one of the real treasure troves of paleontology, like the Gobi Desert for dinosaurs."

The skeleton was divided and sold in two parts, one of which had dropped out of sight. When Dr. Hurum learned that the missing part was for sale, he arranged for its purchase by the Natural History Museum in Oslo and two years ago rounded up a team of German and American scientists to study the bones with CT imaging and other advanced technologies.

Speaking by telephone from Norway, Dr. Hurum recalled: "I realized at first it's a primate. It just screams primate: opposable big toes and thumbs, no evidence of claws. This is like the Archaeopteryx of primate evolution."

The scientists estimated that the primate was about 9 months old, the equivalent of a 6-year-old human. At maturity they suggest that it would have weighed two pounds and been two feet long, most of it tail. It had a broken left wrist, healing at the time of death, and may have drowned in the volcanic lake at Messel. It was, the researchers said, something like a combination "lemur monkey."

Philip D. Gingerich, a member of the team who is a paleontologist of Eocene life at the University of Michigan, said in an e-mail message that in the context of other fossil finds and DNA studies the primate should be considered for a place in the ancestral line leading to living higher primates, including apes and humans.



## 2 Studies Tie Disaster Risk to Urban Growth

By ANDREW C. REVKIN

A pair of new studies say that more people than ever lie in harm's way from earthquakes, droughts, floods and other disasters, largely because of a surge in urban populations in developing countries. Smaller or poorer countries can be devastated by disasters that are relatively inconsequential in places shielded by size or wealth, said one of the reports, a United Nations study that is being released Sunday in Bahrain.

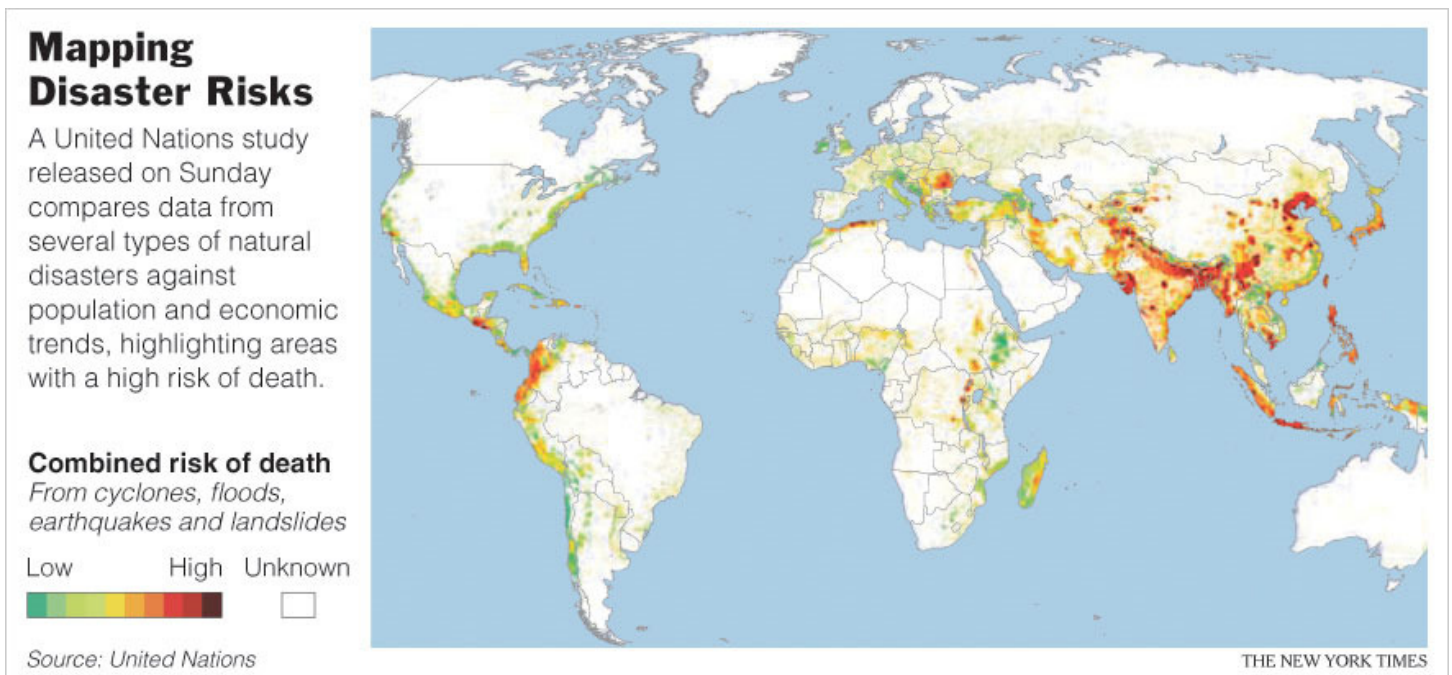
That study, the Global Assessment Report on Disaster Risk Reduction, compared the impact of cyclones in the Philippines and Japan, for example. While more people in Japan are exposed to cyclones, the estimated annual death toll from such storms is 17 times higher in the Philippines, the study said.

Yet the report's authors concluded that the level of vulnerability does not always mirror economic conditions, with high rates of disaster losses seen in a mix of developing countries with growing or weak economies.

The other study, conducted by the Global Network of Civil Society Organizations for Disaster Reduction, a coalition of private nongovernmental groups, notes some isolated examples where communities acting on their own have found ways to reduce disaster losses. But it warned that many governments were lagging in efforts to make such resilience the norm, not the exception, despite having pledged to do so in a declaration in 2005.

The United Nations report is the most ambitious effort ever to compare data on all kinds and scales of disasters against population and economic trends, development and disaster experts said. It is available online at [unisdr.org](http://unisdr.org).

It offers hints of progress. While the economic cost from disasters has risen, the cost as percentage of the global economy has been flat. The mortality rate has been declining in many areas. But in hot spots combining dense populations with the risk of earthquakes, floods and other hazards, the potential for catastrophic impact is growing. Additionally, the study shows how deep poverty and rapid economic growth can increase vulnerability to disasters.



In a telephone interview, Andrew Maskrey, the report's lead author, noted, for example, that the breakneck pace of economic growth in China since 1990 had brought tens of millions of people to the eastern seaboard, "an extremely hazard-prone area that is regularly threatened by flooding and cyclones." "The country has not yet developed the institutional mechanisms to reduce the risk that entails," he said.

He pointed to the collapse of recently built schools last year in central Sichuan Province, another fast-growing area, as a sign of the problem. "Without governance capacity, the faster you develop, it's almost like the faster you're building disasters," Mr. Maskrey said.

He added that Myanmar's enormous losses in cyclone-driven floods last year resulted from virtually the opposite condition: no economic development. "There, people were killed not by schools falling down, but by a lack of schools and other buildings to shelter in," he said.

At the same time, Mr. Maskrey said, there is evidence that a willingness to make disaster risk reduction a priority can forge progress even in struggling places.

Bangladesh has created effective evacuation programs for coastal flooding with scant resources, and Bogotá, Colombia, has found the means to greatly bolster buildings against earthquakes.

Sub-Saharan Africa and other rural areas dependent on rain-fed agriculture remain hot spots for drought-related mortality. But the dominant factor raising death tolls and economic losses from disasters is humanity's hastening transformation into a mainly urban species, with a surge of people in search of work settling in marginal urban lands and shoddy housing.

"Some of the statistics are almost hallucinatory," Mr. Maskrey said. "Some time before 2050, the urban population of India will rise by 500 million people. Mumbai and Calcutta are already very poor about providing land and housing. How will they accommodate tens of millions more? And both cities are in very hazard-prone locations."

The other study of disaster risks took a very different approach from the United Nations analysis, using fewer official databases and relying more on 5,000 interviews with people in vulnerable urban and rural communities in 47 countries, said Marcus Oxley, its lead organizer.

It detailed some innovations that have helped some communities reduce their exposure. In one rural Indian village, the report's authors said, cellphones have become a lifeline, allowing residents to track approaching cyclones through text messages sent by relatives watching Web sites in the United States devoted to weather conditions.

The report, "The View From the Frontline," is to be released next month at an international meeting on disasters, but organizers provided a draft to The New York Times to provide context for the United Nations report.

The isolated success stories are encouraging, Mr. Oxley said. But he added that the sweeping scale of vulnerability to disasters showed the need for systemic changes in policy by governments, aided by institutions like the World Bank and the United Nations.

Education in local communities is needed to overcome a tendency to accept high disaster tolls as a matter of fate, instead of, for example, lax building codes or warning systems.

Ben Wisner, a retired geography professor in Oberlin, Ohio, who is involved with the coalition and focuses on making schools in disaster hot spots safer, said the lack of accountability in many countries, and the tendency of international institutions to focus on symbolism more than concrete change, was blocking progress.

He cited a recent United Nations program that distributed posters and textbooks about disasters. "Does it make sense to teach lessons about natural hazards and disaster risk in a classroom that is liable to collapse and kill students and teachers alike?" he said.

"There is a long, long way to go, and unless and until the U.N. system has the support and political will to name and shame, and to hold countries to account for failing to protect their citizens from avoidable harm in extreme natural events, most national governments won't prioritize disaster risk reduction."

### **New e-readers will end black and white era**

\* 17 May 2009 by Paul Marks and Michael Fitzpatrick

MEDIA frenzy over the launch of Amazon's magazine-sized Kindle e-book reader last week overlooked the fact that, like its predecessors and competitors, it remains resolutely monochrome. Not for long, though. A full-colour version of electronic paper, which forms the display of these devices, is to be demonstrated later this month.

E Ink Corporation of Cambridge, Massachusetts, says it will be demonstrating a colour version of its e-paper at the Society for Information Display conference in San Antonio, Texas, on 31 May, and that products based on its colour e-paper will be on the market by the end of 2010.

The aim is to have a reflective display that uses very little power and is as easy on the eye as the printed word. Like E Ink's monochrome e-paper, used in Sony and Amazon readers, the colour version will be based on technology called an electrophoretic display.

In black-and-white e-paper, each pixel is made up of around 60 plastic microcapsules that contain a negatively charged black powder and a positively charged white powder. To make a pixel black, electrodes underneath the display apply a negative charge to push the black powder to the top. To reproduce shades of grey, some electrodes are positive and others negative, so some microcapsules are white while others in the same pixel are black. Once a page is set, this arrangement uses no power- critical for reading book-length content.

In the new colour display, each pixel will be split into four subpixels showing red, green, blue and white in their "on" states. That means squeezing four times as many transistors beneath each pixel to control the electrodes, which has been a challenge too far- until now. "The transistor resolution is now getting fine enough," says Sri Peruvemba of E Ink. But the proof will be in the quality of image they demonstrate in Texas. Squeezing four times as many transistors beneath each pixel has been a challenge - until now

E-paper is not the only game in town, however. Fujitsu in Japan makes the LCD-based Flepia e-reader, which has a colour screen 20 centimetres on the diagonal. It uses a thin sandwich of red, green and blue layers made from a novel liquid crystal material that, like e-paper, only draws power when changing a page.

Early next year, Plastic Logic of Cambridge, UK, plans to launch A4 e-book readers with flexible transistors- which will make e-reader screens more robust and will also allow the gadgets to begin mimicking the bendiness of paper.

## **Puberty gene sets our sexual clocks**

\* 18:00 17 May 2009 by Ewen Callaway

Some women's biological clocks tick faster than others, and now, researchers have uncovered the first genetic evidence to explain differences in the length of women's fertile lives.

The findings may indicate why some women go through puberty and menopause abnormally early or late. And eventually, the genes identified could lead to treatments for these conditions, as well as for diseases linked to prolonged or shortened fertility, such as breast cancer and osteoporosis, researchers say.

But the most immediate application of the discoveries will be to point biologists studying fertility in the right direction, says André Uitterlinden, a geneticist at Erasmus Medical Center in Rotterdam, the Netherlands.

"It's sort of the tip of the iceberg," says Uitterlinden, who led one of four groups that identified several variations in a gene called LIN28B that affect the timing of girls' first period, or menarche.

His team, as well as independent groups based in the UK, the US and Iceland, uncovered this gene's role by comparing genome-wide scans of thousands of women with their age at menarche.

Across hundreds of thousands of single letter differences peppered across the human genome, all four research teams found genetic variations near the gene LIN28B associated with earlier or later first periods.

### **Under development**

Girls go through menarche between the ages of 9 and 16, and the variations in LIN28B accounted for just one to three months of these differences. For instance, one study found that Icelandic girls with two genetic letter Ts at a spot near LIN28B experience menarche 2.4 months earlier, on average, than girls with two Cs at that site. Just how LIN28B might affect menarche isn't clear, says Ken Ong, a paediatrician at the Medical Research Council Epidemiology Unit in Cambridge, UK, who led another team.

The gene makes a protein that controls the quantities of other proteins a cell produces, and studies in roundworms suggest that the gene is involved in growth and development throughout life.

In humans, LIN28B seems to be involved in variations in adult height, as well. This helps explain why women who go through menarche later are taller than women who have their first period at a young age, says Uitterlinden. Indeed, two teams found that several other genes linked to height also predict age at menarche.

This points to a more general role for the LIN28B in puberty and adolescent development, than menstruation alone, says Ong. His team found a variant near the gene associated with earlier breast development in girls and, in boys, earlier voice-breaking. "Showing it in boys means [LIN28B] is more fundamental, not just to puberty, but to the timing of growth as well," he says.

### **Menopause control**

Genes also play a role in menopause, and two research teams have identified several gene variants associated with advancing or delaying menopause by as much as two years.

As with menarche, these variants explain just a small percentage of the differences between the age at which women go through menopause, which range between about 40 and 60.

To find other genes associated with these traits, researchers will need to scan the genomes of even more women and look for less common genetic variations, says Kári Stefánsson, CEO of deCODE Genetics in Reykjavik, Iceland.

All four teams focused their hunts on gene variations found in at least 10 per cent of the population, while Stefánsson thinks that rarer variants may play a more significant role in menarche.

However, this shouldn't hinder efforts to understand the biology of menarche and menopause and eventually target them with drugs, he says. "The complexity of our biology is fairly limited, so it is highly likely that rare variants are going to affect the same biochemical pathways."

*Journal references: Nature Genetics (DOI: 10.1038/ng.382; DOI: 10.1038/ng.383; DOI: 10.1038/ng.385; DOI: 10.1038/ng.386; DOI: 10.1038/ng.387)*

## **Early mobilization of patients in ICU improves outcomes**

ATS 2009, SAN DIEGO—Aside from the obvious and immediate health problems that patients undergoing mechanical ventilation face, those who recover often do so with profound loss of strength and mobility that can impair their daily functioning and even lead to increased risk of morbidity and mortality down the line. Now research shows that functional status may be restored earlier to ICU patients by performing daily interruptions in sedation paired with mobilization and exercise, as led by physical and occupational therapists.

The study results will be announced on May 17 at the 105th International Conference of the American Thoracic Society in San Diego.

"Weakness and loss of functional independence—the inability to transfer from bed, walk and execute typical daily self-care activities, such as cleaning and dressing oneself—are commonly experienced among patients discharged from the intensive care unit," said William Schweickert, M.D., assistant professor of medicine in the Pulmonary, Allergy, and Critical Care Division at the University of Pennsylvania Medical Center. "This can result in major disability and protracted rehabilitation and may be accelerated or exacerbated by prolonged periods of immobility, especially among patients who undergo mechanical ventilation and sedation."

"Because ICU-acquired weakness is associated with such poor outcomes and potentially exacerbated by deep sedation and immobility, we wanted to see whether mobilization begun in the earliest days of respiratory failure would improve patient function at hospital discharge and reduce delirium," he continued.

Dr. Schweickert and colleagues conducted a randomized trial of 100 patients who were undergoing sedation and mechanical ventilation in the ICU. They compared patients who underwent a protocol of daily mobilization in conjunction with sedative interruption with those who underwent sedative interruption alone and therapy services as ordered by their primary care team.

They found that patients who underwent the mobilization protocol were more frequently able to get out of bed, stand and occasionally walk with assistance during mechanical ventilation. The physical regimens prescribed by the primary care team, on the other hand, often began only after mechanical ventilation was no longer needed, potentially leading to a longer loss of functional status and a longer recovery time. The degree of functional loss in the control arm was substantial—only one third of patients left the hospital able to function independently. In contrast, nearly 60 percent of the early mobilization patients had achieved independence.

"Overall, patients in the mobilization group were nearly twice as likely to regain their functional independence at hospital discharge and experienced less delirium than did their counterparts who did not receive the intervention," said Dr. Schweickert.

"The benefits of pairing mobilization and sedative interruption from the inception of critical illnesses are substantial, but the improvements in function are not easily recognizable until about two weeks," observed Dr. Schweickert, adding that "starting these therapies early can be difficult in the context of ongoing critical illness, yet the data highlights that it can be done safely. We still need to test how this intervention and its findings translate into longer-term survival and better quality of life."