

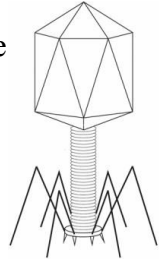
## Tracking viruses back in time

September 6th, 2010 in Space & Earth / Earth Sciences Source: Astrobio.net, by Henry Bortman

How long have viruses been around? No one knows. Scientists at Portland State University have begun taking the first steps toward answering this question.

Viruses are a curious lot. The standard drawing of the tree of life, the one you find on the inside back cover of biology textbooks, is divided into three branches: Archaea, Bacteria and Eukarya. Viruses don't make it onto the page.

That makes sense, some scientists argue, because they're not alive. They can't reproduce on their own; they require the cozy environment of living cells for their survival. Others disagree. Not only are viruses alive, they say, but genetic evidence indicates that they may have been the first forms of life on Earth, predating cellular life.



***A simplified drawing of a Bacteriophage T4 virus particle, which resembles a lunar lander. The large faceted structure at the top, known as the capsid or head, contains the virus's genetic material.***

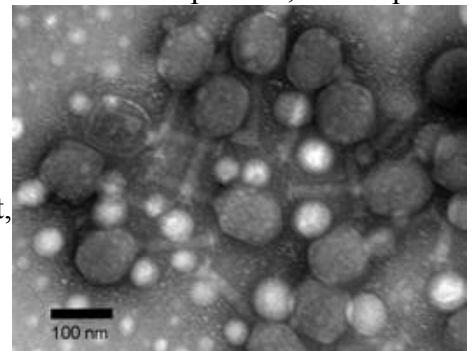
But really, says Ken Stedman, associate professor of biology at Portland State University, "Nobody knows how old viruses are." Stedman and his colleagues are working to change that. Unlike bacteria, for which there is an undisputed rock record going back as far as 3.5 billion years, there is no known fossil record for viruses. "As far as we know," Stedman says, "no-one has looked." It's possible, he concedes, that there have been efforts, unsuccessful efforts that no one knows about, to uncover fossil viruses. But "If you don't find something, you're not likely to report it."

In an attempt to learn how long viruses have been around, Stedman's lab, in work led by his doctoral student, Jim Laidler, is trying to figure out what kind of biosignatures viruses might leave behind. This lab-first approach, Stedman said, is necessary because "we don't know what we're looking for yet."

Much of the work of Stedman's group is done in hot springs. Silica hot springs, in particular, are known to provide a good preservation environment for bacteria. Silica precipitates out of the hot water as the water cools, and bacteria that are present can become entombed in the silica-rich rock that forms. In the process, the shapes and the chemical signatures of these bacteria can be preserved.

Stedman's group wanted to see if they could induce a similar process using viruses instead of bacteria. The first virus they chose was Bacteriophage T4, "sort of the prototypical virus," which has a well-known shape. It "looks like the lunar lander," Stedman said.

Mixing the virus with silica-rich hot-spring water yielded a positive result, briefly. For a few days, under the microscope, virus shapes could be seen embedded within the silica. But "after about a week it starts to look like a blob," Stedman said. Not too hopeful a result, if the ultimate goal is to look for visual evidence of viruses in rocks billions of years old.



***The dark round blobs in this photomicrograph are the capsids of Bacteriophage T4 virus particles, which retain their characteristic shape after being coated with silica. The long, straight "tails" of many of the virus particles can be seen extending from the capsids in this image as well. Credit: Jim Laidler***

But Stedman and his colleagues are not deterred. They have a number of additional avenues of investigation planned. One is to try the experiment with viruses that come from hot springs, where Stedman does much of his research. "It may be that these are much more resistant" to disintegration, he said, that they "form a structure" that is "better conserved" over time.

Another approach researchers plan to pursue is looking for chemical signatures. Although the physical shape of the virus doesn't stick around for long, it's possible that a detectable chemical signal may remain for longer. Alternatively, because some viruses have lipid coatings, similar to the lipids found in the walls of living cells, lipids may provide a detectable chemical signature. Virus lipids can differ chemically from the lipids found in their microbial hosts, and that distinction may prove useful in the chemical detection of fossil viruses. "We don't know if there is actually a different signature between the host and the virus," Stedman said.

So far, research has focused on the silicification of individual virus particles. Some viruses, however, particularly those that live inside algae, tend to cluster together in large numbers. They "almost form crystalline arrays," Stedman said. These larger masses may fossilize in ways that are easier to detect.

Laidler plans to explore all these various approaches in the lab, and also to study hot-spring sites in search of effects that can be clearly identified on a short time scale. If those efforts pan out and clear chemical biosignatures of virus signatures can be identified, Stedman says, "those then could become something that we can now start to look at back through the rock record."

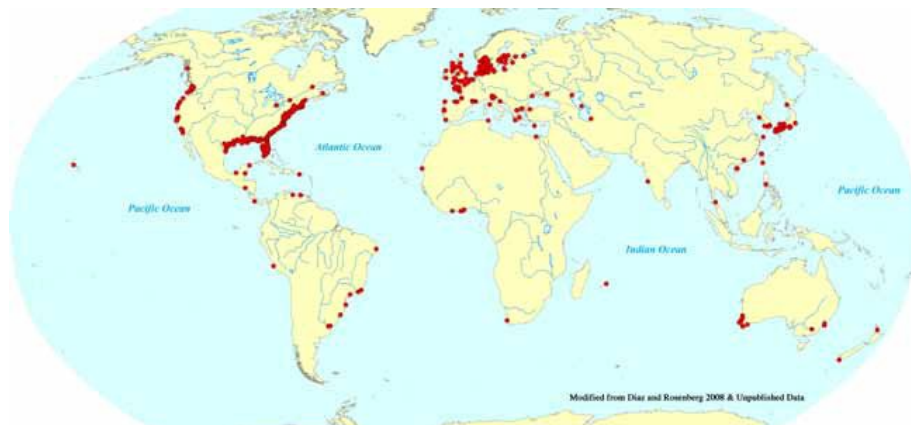
Results of Laidler's initial work on virus silicification was published in the July/August 2010 issue of the journal *Astrobiology*. He and Stedman hope that future research into fossil viruses will help to fill in gaps in biologists' knowledge about the role viruses played in the development of life on Earth. It may even answer the question: which came first, the virus or the cell?

## **New report warns of expanding threat of hypoxia in U. S. coastal waters**

### ***Scientific Assessment of Hypoxia in U.S. Coastal Waters***

A report issued today by key environmental and scientific federal agencies assesses the increasing prevalence of low-oxygen "dead zones" in U.S. coastal waters and outlines a series of research and policy steps that could help reverse the decades-long trend.

The interagency report notes that incidents of hypoxia - a condition in which oxygen levels drop so low that fish and other animals are stressed or killed - have increased nearly 30-fold since 1960. Incidents of hypoxia were documented in nearly 50 percent of the 647 waterways assessed for the new report, including the Gulf of Mexico, home to one of the largest such zones in the world.



***Global distribution of systems affected by low dissolved oxygen.***

The impact of the BP Deepwater Horizon oil spill on oxygen levels in the Gulf of Mexico was not considered in this report because the spill had not yet occurred at the time the report was completed. Only additional research will reveal how the presence of oil in the Gulf is affecting the large dead zone that forms every summer to the west of the Mississippi delta (see fact sheet), the more than 100 other independent sites along the Gulf of Mexico coast that experience low-oxygen problems, and areas of naturally-occurring deepwater oxygen depletion.

Federal research programs are addressing many aspects of the problem of hypoxia, and coordination among the relevant governmental entities is increasing, the report finds; as a result, some areas are now in better condition than they were a few decades ago. But overall, management efforts to stem the tide of hypoxia "have not made significant headway," the report concludes, in part due to increased development and population growth in coastal watersheds.

"The Nation's coastal waters are vital to our quality of life, our culture, and the economy. Therefore, it is imperative that we move forward to better understand and prevent hypoxic events, which threaten all our coasts," wrote Nancy H. Sutley, chair of the Council on Environmental Quality, and John P. Holdren, Director of the Office of Science and Technology Policy, in a letter accompanying the 163-page report, *Scientific Assessment of Hypoxia in U.S. Coastal Waters*, which was delivered today to Congressional leaders.

Unnatural levels of hypoxia, which occur mostly in the summer, are primarily the result of human activities that deliver nutrients such as nitrogen and phosphorous into waterways. Fertilizer runoff from agricultural, urban and suburban landscapes, sewage discharges, and air pollution are major contributors. The supply of added nutrients entering bodies of water supports blooms of algae, which in turn are decomposed by oxygen-depleting bacteria. The resulting hypoxia can suffocate animals that cannot move away, such as shellfish, and - depending on how quickly the hypoxia develops - either kill or force into less suitable habitat free-swimming animals such as fish, shrimp, and crabs. The new report, produced by an interagency working group of the National Science and Technology Council's Committee on Environmental and Natural Resources, also notes that climate change may be causing or exacerbating the problem.

Hypoxia has been prevalent throughout the Gulf of Mexico and the mid- and south-Atlantic coastal regions since the 1980s. Chesapeake Bay, in the mid-Atlantic region, has suffered from repeated summer bouts of hypoxia going back at least to the 1950s.

"The report shows good progress on research into the causes of hypoxia and the specific management requirements to restore systems such as the Gulf of Mexico and Chesapeake Bay, but we still have a long way to go to reduce this environmental threat," noted Jane Lubchenco, Ph.D., administrator of the National Oceanic and Atmospheric Administration (NOAA), the lead agency involved in the report's preparation. "The discovery of a new seasonal hypoxic zone off the coast of Oregon and Washington that may be linked to a changing climate emphasizes the complexity of this issue."

The area off the Oregon and Washington coast is now the second largest seasonal hypoxic zone in the United States and third largest in the world (the largest is in the Baltic Sea), with serious repercussions for natural ecosystems and protected resources, including commercial fisheries. The report also finds that the Pacific and North Atlantic coasts have experienced the largest increase in hypoxic sites since the 1980s. In the last 20 years, the Pacific coast experienced a six-fold increase in the number of hypoxic sites, with 37 areas now experiencing low oxygen problems.

“This report contains the latest and most in-depth science assessing the environmental impact of low-oxygen dead zones, and EPA is proud to have played a key role in developing the study,” said EPA Administrator Lisa P. Jackson. “These growing dead zones endanger fragile ecosystems and potentially jeopardize billions of dollars in economic activity. This science can be the foundation for measures that will preserve our waters and reverse the trend, including innovative, watershed-based solutions to this challenge.”

The report also documents expanding efforts to reduce the flow of nutrients into coastal waters. “The Obama Administration has taken aggressive action to address water quality in the Mississippi River Basin and in turn, in the Gulf of Mexico,” said USDA Secretary Tom Vilsack. “For instance, USDA’s new Mississippi River Basin Healthy Waters Initiative is a targeted, science-based effort to give agricultural producers the tools and incentives they need to improve water quality.”

The report had significant inputs from the Environmental Protection Agency (EPA), Department of Agriculture (USDA), U.S. Geological Survey (USGS), and the Virginia Institute of Marine Science. It provides a comprehensive list of the more than 300 U.S. coastal water bodies affected by hypoxia and, in eight case studies, highlights a range of representative ecosystems affected by hypoxia. It also describes Federal investments in research and monitoring of hypoxia and identifies future research priorities that span several Federal agencies.

“Significant progress has been made on monitoring to define the source areas and yields of nutrients delivered to coastal waters by streams and rivers and on modeling to determine the human activities that are the most significant contributors to those nutrient yields,” said USGS Director Marcia K. McNutt. “With some improvements this monitoring and modeling information would enable best management practices and mitigation measures to be targeted in the watersheds and on the human activities that have the most significant effect on decreasing nutrient transfer from land to coastal ecosystems.”

Each agency brings a unique expertise to the table. NOAA has focused on monitoring and improving the quantitative understanding of hypoxia’s causes and its impacts on commercially- and ecologically-important living resources in coastal waters. EPA’s work addresses areas from freshwater ecosystems to estuaries and coastal waters and emphasizes implementing regulatory approaches to managing nutrient enrichment, including those resulting from wastewater treatment plants - so-called point sources of nutrient runoff and large-scale “nonpoint sources” of runoff. The USGS has provided critical measurements and modeling of freshwater and nutrient delivery to coastal waters throughout the Nation. Using information developed by these agencies, the USDA has been responsible for developing and implementing strategies to reduce nutrient inputs to coastal waters from agricultural lands.

Enhanced monitoring of rivers and coastal waters and more support for research to understand the complex underlying science of hypoxia and to predict the range of impacts of hypoxia on ecosystems will be crucial if current trends are to be reversed, the report concludes. As a national assessment, the report also provides crucial baseline information to assess future progress in controlling hypoxia.

*The report is the final of five reports mandated by Congress in the Harmful Algal Bloom and Hypoxia Amendments Act of 2004 and is available online at: <http://www.whitehouse.gov/administration/eop/ostp/nstc/oceans> Provided by NOAA*

### **Magic mushrooms reduce anxiety over cancer**

21:00 06 September 2010 by **Jessica Griggs**

The active ingredient of magic mushrooms, psilocybin, has been shown to reduce anxiety and improve mood in people with cancer. Charles Grob from Harbor-UCLA Medical Center in Torrance, California, and colleagues, recruited 12 people with advanced-stage cancer who also suffered from anxiety.

The volunteers received one dose of psilocybin or the vitamin niacin. Several weeks later they received the other treatment. The volunteers' heart rate, blood pressure and temperature were monitored throughout each treatment. They were also assessed for levels of depression, anxiety and mood.

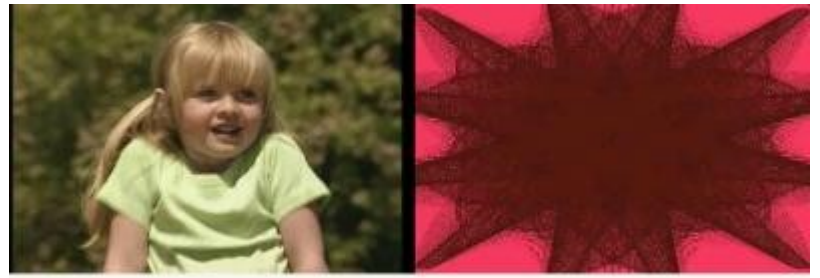
Volunteers reported feeling less depressed and anxious two weeks after receiving psilocybin but not two weeks after niacin alone. Six months later, the level of depression was significantly lower in all volunteers than it had been before the treatments began.

Volunteers reported mildly altered states of consciousness after receiving psilocybin but noted no adverse physiological effects. With higher doses, the authors suggest the beneficial effects could become more pronounced, although further tests are needed to examine safety and efficacy.

*Journal reference: Archives of General Psychiatry, DOI: 10.1001/archgenpsychiatry.2010.116*

### **Visual pattern preference may be indicator of autism in toddlers**

Using eye-tracking methods, researchers at the University of California, San Diego School of Medicine have shown that toddlers with autism spend significantly more time visually examining dynamic geometric patterns than they do looking at social images - a viewing pattern not found in either typical or developmentally delayed toddlers. The results of the study suggest that a preference for geometric patterns early in life may be a signature behavior in infants who are at-risk for autism. This preference was found in infants at-risk for autism as young as 14 months of age.



**Which Do You Prefer?**

*The left image shows a social scene while the right image is geometric. Credit: UC San Diego*

“In testing 110 toddlers ages 14 to 42 months, we found that all of the toddlers who spent more than 69 percent of their time fixing their gaze on geometric images could be accurately classified as having an autism spectrum disorder or ASD,” said Karen Pierce, PhD, an assistant professor in the UCSD Department of Neurosciences and assistant director of the UCSD Autism Center of Excellence. The study will be published in the September 6 issue of the *Archives of General Psychiatry*.

During this study, babies ranging in age between 12 and 42 months sat on their mother’s lap as they watched a one-minute movie that contained shapes moving on one side of the screen (i.e., “dynamic geometric patterns) and children dancing and doing yoga on the other (i.e., “dynamic social images”). Using an infrared light beam that bounces off the eye, Pierce and colleagues were able to measure what the baby liked to look at by measuring the amount of time they examined each side of the screen. Interestingly, the dynamic geometric patterns that absorbed the attention of autistic but not normal babies, was nothing more than a common screen saver found on most computers.

Out of 51 typical infants in this study, only one preferred to look at the geometric images. However, not all autistic toddlers preferred the geometric shapes. In the UCSD study, 40 percent of the ASD toddlers had this preference, compared to just two percent of the typical and nine percent of the developmentally delayed toddlers. Thus, while 40 percent of the ASD toddlers were “geometric responders,” the remaining 60 percent were similar to the typical and developmentally delayed groups in preferring dynamic social images.

“What an infant prefers to look at when given a choice between two images may turn out to be a more clearly observable indicator of autism risk than how he or she looks at a single image,” Pierce said. “Among toddlers who strongly prefer geometric patterns, we found that - almost 100 percent of the time - those children developed an autism spectrum disorder.”

A preference for geometric patterns alone may be an intriguing novel identifier of early autism, but the research results also illustrated a distinct pattern of saccades - rapid, directed eye movements - among the geometric responders.

“We initially predicted that ASD toddlers overall would show a reduced number of saccades,” Pierce explained. However, results revealed that it was only the geometric responders, not the group as a whole, who displayed a reduced number of saccades; and this pattern was only evident when they were viewing their preferred geometric patterns. “It was almost as if they got ‘stuck’ and didn’t move their eyes as much as typical toddlers when viewing geometric patterns. The geometric patterns were apparently very absorbing to them.”

The researchers concluded that a preference for moving geometric patterns, combined with how long toddlers stare when looking at moving geometric images, might be an early identifier of autism.

“If your baby occasionally enjoys looking at the screen saver on your computer, it is no cause for alarm,” said Pierce. “But if your baby looks at such moving geometric patterns for long periods of time, but not at fun, social images, you might want to check for other early warning signs of autism.”

Such warning signs include reduced enjoyment during back-and-forth games like peek-a-boo; the presence of an unusual tone of voice; a lack of pointing at or bringing objects to show; and a failure to respond when his/her name is called.

"If your baby shows multiple such 'red-flags,' then speak to your pediatrician about a developmental evaluation," Pierce advised.

*More information: Arch Gen Psychiatry. Published online September 6, 2010. doi:10.1001/archgenpsychiatry.2010.113*

## **Woolly Mammoth, Woolly Rhinoceros and Reindeer Lived on Iberian Peninsula 150,000 Years Ago, Findings Show**

ScienceDaily (Sep. 7, 2010) - A team made up of members of the University of Oviedo (UO) and the Complutense University of Madrid (UCM) have gathered together all findings of the woolly mammoth, the woolly rhinoceros and the reindeer in the Iberian Peninsula to show that, although in small numbers, these big mammals - prehistoric indicators of cold climates - already lived in this territory some 150,000 years ago.

The presence of the woolly mammoth (*Mammuthus primigenius*), the woolly rhinoceros (*Coelodonta antiquitatis*), the reindeer (*Rangifer tarandus*), and to a lesser extent the wolverine (*Gulo gulo*), the arctic fox (*Alopex lagopus*), the musk-ox (*Ovibos moschatus*) and the Saiga antelope (*Saiga tatarica*), has been linked to the paleoclimatic scale created on the basis of the isotopic composition of oxygen in the ice of Greenland.

"The findings of cold climate fauna in the Iberian Peninsula coincide with the periods of greatest global cooling recorded in the ice of Greenland," Diego Álvarez-Lao, main author of the work and researcher in the Palaeontology Department of the UO explains.

The study, which has been published in the journal *Quaternary International*, reveals that the oldest remains of mammals adapted to cold climates found in the Iberian Peninsula belong to great prehistoric mammals which lived isolated in Spain 150,000 years ago.

The "glacial fauna" entered the Peninsula at that time because "the environmental conditions in central and northern Europe were so extreme that the animals were obliged to migrate to the south, where the climate was less severe," Álvarez-Lao explains.

44,000 years ago these animals became more common in the Iberian Peninsula but only for periods. "The cold periods (with the presence of glacial fauna) alternated with milder periods," adds the researcher.

### **The increase in temperatures caused a biological crisis**

According to the team, the last findings of these cold species date back some 10,000 years, and coincide with the end of the glaciations. At that time, the climate became warmer in the whole northern hemisphere and the favourable habitat for these faunas was reduced to increasingly more northern latitudes and to smaller spaces.

"The increase in temperatures caused a genuine biological crisis for these animals from extremely cold climates. Some species such as the reindeer and the arctic fox found their new habitat in the arctic regions of the planet, where they still survive today. Others, such as the woolly mammoth and the woolly rhinoceros weren't so lucky," specifies the paleontologist.

According to the studies of pollen remains associated with these findings, the landscape of the period in which the great mammals lived in the Iberian Peninsula comprised mainly of steppes, or herbaceous vegetation. "Trees would have been very scarce in these times of extreme cold and environmental aridity," Álvarez-Lao points out.

### **More than 72 sites with remains of mammals**

The Spanish researchers found the fossil remains of glacial climate fauna in 72 Iberian sites, the majority of which are in the north of the peninsula (Cornisa Cantabrica and Catalonia). There are also some traces in inland areas of the peninsula and even in the south, where the site of the woolly mammoths of Padul (Granada) lies.

"These species lived alongside different human cultures. There is evidence in some sites of the Basque country, Navarra and Catalonia that the Neanderthals coexisted with the mammoths and the reindeer at specific times. However, the majority of evidence of these faunas coincides with the periods of the Gravettian, Solutrean and Magdalenian cultures (during the Upper Paleolithic era in West Europe)," states Álvarez-Lao.

*Journal Reference:* 1. Diego J. Álvarez-Lao, Nuria García. Chronological distribution of Pleistocene cold-adapted large mammal faunas in the Iberian Peninsula. *Quaternary International*, 2010; 212 (2): 120 DOI: 10.1016/j.quaint.2009.02.029

## **Quality measurement programs could shortchange physicians caring for at-risk patients**

### **Physician quality ratings appear to be affected by characteristics of patients cared for**

Evaluating the quality of care delivered by individual physicians without accounting for such factors as their patients' socioeconomic status or insurance coverage risks undervaluing the work of those caring for a higher proportion of vulnerable patients. In the Sept. 8 *Journal of the American Medical Association* a team of Massachusetts General Hospital (MGH) researchers describe finding that primary care physicians' rankings on common quality measures appear to be associated with the characteristics of the patients they care for. Adjusting physician rankings based on patient characteristics significantly changed the quality rankings for many physicians.

"Physicians have increasingly become the focus of quality measurement, and many health care systems use quality assessment as part of their recertification process," explains Clemens Hong, MD, MPH, MGH Division of General Medicine, the paper's lead author. "Pay-for-performance and public reporting programs based on these measures have become widely adopted approaches, but many physicians are concerned about fairness. For example, if a doctor recommends a colonoscopy for a patient who cannot afford the test because he has no insurance coverage, that physician might be ranked lower than one who cares for a higher percentage of insured patients."

The study analyzed data from 2003 through 2005 reflecting more than 125,000 adult patients cared for by 162 primary care physicians at nine MGH-affiliated practices and four community health centers. After initially ranking all physicians based on nine common quality measures - such as whether eligible patients received mammograms, Pap smears, colonoscopies and standard monitoring for those with diabetes or cardiovascular disease - they compared patient characteristics between top- and bottom-tier providers. The researchers then accounted for the full range of patient variables and recalculated the rankings to look how they changed based on those characteristics.

The authors found that primary care physicians whose unadjusted quality rankings placed them in the top tier had patients who tended to be older men with many health problems and frequent visits to the doctor. Top-tier physicians were also less likely to practice in community health centers. Patients of bottom-tier physicians were more likely to be minority, non-English speaking, covered by Medicaid or uninsured, and to live in low-income neighborhoods. But for one third of the physicians, adjusting rankings for patient characteristics led to significant changes in their quality rankings, and further analysis revealed that those whose quality rankings improved after adjustment were more likely to work in community health centers and care for patient panels with greater proportions of underinsured, minority and non-English speaking patients.

"Our health system is under intense pressure to both improve quality and contain costs, and to do that we need to address both how we deliver care and how we pay for it," says Hong, an instructor in Medicine at Harvard Medical School. "Incentive programs that do not address patient differences risk directing resources away from providers caring for these vulnerable patients and worsening health care disparities. We do not want to give a pass to doctors who provide poor care, but we want to make sure that those who provide good care to the most vulnerable patients aren't penalized. Much work needs to be done to design incentive schemes that are fair to all doctors while improving care and reducing disparities for our most vulnerable patients."

*Co-authors of the JAMA report are Richard Grant, MD, MPH, senior author, and Steven Atlas, MD, MPH, Yuchiao Chang, PhD, Jeffrey Ashburner, MPH, Michael Barry, MD - all of the MGH Division of General Medicine - and S.V. Subramanian, PhD, Harvard School of Public Health. The study was supported by grants from the National Institutes of Health and the Agency for Healthcare Research and Quality.*

### **Morning sickness: Still no relief**

There are currently no reliably safe and effective treatments for morning sickness, according to Cochrane researchers who conducted a systematic review of the available evidence. There was very limited evidence for all pharmaceutical and alternative medicines tested.

Morning sickness is the term used to describe vomiting and feelings of nausea in pregnant women. Symptoms can in fact occur at any time of the day and affect more than half of all women in the early stages of pregnancy. Due to concerns that pharmaceutical medicines may damage their unborn children, women are increasingly turning to non-drug treatments, including complementary and alternative therapies, to treat these symptoms. However, there is less evidence that alternative therapies work and they tend to be less well-regulated.

The review included 27 randomised controlled trials, which together involved 4,041 women who were up to 20 weeks pregnant. Benefit was measured by various scales commonly used to gauge the severity of nausea at a time as close as possible to three days after treatment. In six studies of acupressure and two of acupuncture there were no significant differences in benefit compared to control groups. One study of acustimulation did, however, report some improvement over three weeks. There was limited evidence of an effect of ginger in relieving nausea, as there was for vitamin B6, antihistamines and antiemetic (anti-vomiting) drugs including the antenatal drug Debendox.

In addition, some of the treatments caused adverse effects including drowsiness in those taking antiemetics. Ginger caused heartburn in some people.

"A number of the studies we looked at appeared to show benefits, but in general the results were inconsistent and it was difficult to draw firm conclusions about any one treatment in particular," said lead researcher Dr Anne Matthews, of the School of Nursing at Dublin City University in Dublin Ireland. "We were also unable to

obtain much information about whether these treatments are actually making a difference to women's quality of life."

"Despite the wealth of different treatments available, it is not possible currently to identify with confidence any safe and effective interventions for nausea and vomiting in early pregnancy," said Matthews. "The difficulties in interpreting the results of the studies highlight the need for further, more rigorous trials in this area."

### **Can we spot volcanoes on alien worlds? Astronomers say yes**

Volcanoes display the awesome power of Nature like few other events. Earlier this year, ash from an Icelandic volcano disrupted air travel throughout much of northern Europe. Yet this recent eruption pales next to the fury of Jupiter's moon Io, the most volcanic body in our solar system.

Now that astronomers are finding rocky worlds orbiting distant stars, they're asking the next logical questions: Do any of those worlds have volcanoes? And if so, could we detect them? Work by theorists at the Harvard-Smithsonian Center for Astrophysics suggests that the answer to the latter is a qualified "Yes."

"You would need something truly earthshaking, an eruption that dumped a lot of gases into the atmosphere," said Smithsonian astronomer Lisa Kaltenegger. "Using the James Webb Space Telescope, we could spot an eruption 10 to 100 times the size of Pinatubo for the closest stars," she added.

Astronomers are decades away from being able to image the surface of an alien world, or exoplanet. However, in a few cases they have been able to detect exoplanet atmospheres for gas giants known as "hot Jupiters." An eruption sends out fumes and various gases, so volcanic activity on a rocky exoplanet might leave a telltale atmospheric signature.

To examine which volcanic gases might be detectable, Kaltenegger and her Harvard colleagues, Wade Henning and Dimitar Sasselov, developed a model for eruptions on an Earth-like exoplanet based on the present-day Earth. They found that sulfur dioxide from a very large, explosive eruption is potentially measurable because a lot is produced and it is slow to wash out of the air.

"Our first sniffs of volcanoes from an alien Earth might be pretty rank!" Kaltenegger said. "Seeing a volcanic eruption on an exoplanet will show us similarities or differences among rocky worlds."

The 1991 eruption of Mount Pinatubo in the Philippines spewed about 17 million tons of sulfur dioxide into the stratosphere - a layer of air 6 to 30 miles above Earth's surface. The largest volcanic eruption in recorded history, the 1815 Tambora event, was about 10 times more powerful.

Such gigantic eruptions are infrequent, so astronomers would have to monitor many Earth-sized planets for years to catch one in the act. However, if alien worlds are more volcanically active than Earth, success might be more likely.

"A Tambora-sized eruption doesn't happen often here, but could be more common on a younger planet, or a strongly tidally active planet - analogous to Io," said Henning. "Once you detected one eruption, you could keep watch for further ones, to learn if frequent eruptions are common on other planets."

To look for volcanic sulfur dioxide, astronomers would rely on a technique known as the secondary eclipse, which requires the exoplanet to cross behind its star as seen from Earth. By collecting light from the star and planet, then subtracting the light from the star (while the planet is hidden), astronomers are left with the signal from the planet alone. They can search that signal for signs of particular chemical molecules.

Due to its proximity, a hypothetical Earth or super-Earth orbiting Alpha Centauri would offer a best-case scenario for a sun-like star. A super-Earth orbiting a smaller host star close to our own Sun would show the biggest signal. But any Earth-like planet less than 30 light-years away could show faint signs of volcanism when studied with the James Webb Space Telescope.

### **Short sleepers at higher risk of diabetes and heart disease**

People who sleep less than six hours a night may be three times more likely to develop a condition which leads to diabetes and heart disease, according to researchers at the University of Warwick.

A study by a team of researchers from Warwick Medical School and the State University of New York at Buffalo has found short sleep duration is associated with an elevated risk of a pre-diabetic state, known as incident-impaired fasting glycaemia (IFG).

IFG means that your body isn't able to regulate glucose as efficiently as it should. People with IFG have a greater risk of developing type 2 diabetes and are at an increased risk of heart disease and stroke.

The study has just been published in the *Annals of Epidemiology* journal. The researchers looked at six years of data from 1,455 participants in the Western New York Health Study.

All participants were aged between 35 and 79 years old and all completed a clinical examination that included measures of resting blood pressure, height and weight. They also completed questionnaires about their general health and wellbeing and sleeping patterns.

Lead author at Warwick Medical School Dr Saverio Stranges said: "We found that short sleep, less than six hours, was associated with a significant, three-fold increased likelihood of developing IFG, compared to people who got an average of six to eight hours sleep a night."

This study is the first to look at the association between sleep duration and IFG. Dr Stranges said there were a number of ways in which sleep loss could lead to disordered glucose metabolism.

He said: "Previous studies have shown that short sleep duration results in a 28% increase in mean levels of the appetite stimulating hormone ghrelin so it can affect feeding behaviours. Other studies have also shown that a lack of sleep can decrease glucose tolerance and increases the production of cortisol, a hormone produced in response to stress."

"More research is needed but our study does suggest a very strong correlation between lack of sleep and type 2 diabetes and heart disease."

Professor Francesco Cappuccio, Head of the Sleep, Health & Society Programme at the University of Warwick said: "These results are welcome and confirm our early reports that both sleep quantity and quality are strong predictors of the development of type 2 diabetes, strokes and heart attacks".

### **Unusual feed supplement could ease greenhouse gassy cows**

Cow belches, a major source of greenhouse gases, could be decreased by an unusual feed supplement developed by a Penn State dairy scientist.

In a series of laboratory experiments and a live animal test, an oregano-based supplement not only decreased methane emissions in dairy cows by 40 percent, but also improved milk production, according to Alexander Hristov, an associate professor of dairy nutrition.

The natural methane-reduction supplement could lead to a cleaner environment and more productive dairy operations.

"Cattle are actually a major producer of methane gas and methane is a significant greenhouse gas," Hristov said. "In fact, worldwide, livestock emits 37 percent of anthropogenic methane."

Anthropogenic methane is methane produced by human activities, such as agriculture.

Compared to carbon dioxide, methane has 23 times the potential to create global warming, Hristov said. The Environmental Protection Agency bases the global warming potential of methane on the gas's absorption of infrared radiation, the spectral location of its absorbing wavelengths and the length of time methane remains in the atmosphere.

Methane production is a natural part of the digestive process of cows and other ruminants, such as bison, sheep and goats. When the cow digests food, bacteria in the rumen, the largest of the four-chambered stomach, break the material down into nutrients in a fermentation process. Two of the byproducts of this fermentation are carbon dioxide and methane.

"Any cut in the methane emissions would be beneficial," Hristov said.

Experiments revealed another benefit of the gas-reducing supplement. It increased daily milk production by nearly three pounds of milk for each cow during the trials. The researcher anticipated the higher milk productivity from the herd.

"Since methane production is an energy loss for the animal, this isn't really a surprise," Hristov said. "If you decrease energy loss, the cows can use that energy for other processes, such as making milk."

Hristov said that finding a natural solution for methane reduction in cattle has taken him approximately six years. Natural methane reduction measures are preferable to current treatments, such as feed antibiotics.

Hristov first screened hundreds of essential oils, plants and various compounds in the laboratory before arriving at oregano as a possible solution. During the experiments, oregano consistently reduced methane without demonstrating any negative effects.

Following the laboratory experiments, Hristov conducted an experiment to study the effects of oregano on lactating cows at Penn State's dairy barns. He is currently conducting follow-up animal trials to verify the early findings and to further isolate specific compounds involved in the suppression of methane.

Hristov said that some compounds that are found in oregano, including carvacrol, geraniol and thymol, seem to play a more significant role in methane suppression.

Identifying the active compounds is important because pure compounds are easier to produce commercially and more economical for farmers to use.

"If the follow-up trials are successful, we will keep trying to identify the active compounds in oregano to produce purer products," said Hristov.

Hristov has filed a provisional patent for this work.



## **Is hand washing enough to stop the spread of disease?**

Not drying your hands thoroughly after washing them, could increase the spread of bacteria and rubbing your hands whilst using a conventional electric hand dryer could be a contributing factor. Frequently people give up drying their hands and wipe them on their clothes instead, but hand-hygiene is a key part of infection control and drying hands after washing is a very important part of the process.

A study by researchers at the University of Bradford and published today in the Journal of Applied Microbiology looked at different methods of hand drying, and their effect on transfer of bacteria from the hands to other surfaces. The different methods included paper towels, traditional hand dryers, which rely on evaporation, and a new model of hand dryer, which rapidly strips water off the hands using high velocity air jets.

Our bodies naturally have bacteria called commensals all over them. However, bacteria from other sources, such as raw meat, can also survive on hands, and can be easily transferred to other surfaces, increasing the risk of cross-contamination. When hands are washed the number of bacteria on the surface of the skin decreases, but they are not necessarily eliminated. If the hands are still damp then these bacteria are more readily transferred to other surfaces.

In this study the researchers quantified the effects of hand drying by measuring the number of bacteria on different parts of the hands before and after different drying methods. Volunteers were asked to wash their hands and place them onto contact plates which were then incubated to measure bacterial growth. The volunteers were then asked to dry their hands using either hand towels or one of three hand dryers, with or without rubbing their hands together, and levels of bacteria were re-measured.

Dr Snelling and her team found that rubbing the hands together whilst using traditional hand dryers could counteract the reduction in bacterial numbers following handwashing. Furthermore, they found that the relative reduction in the number of bacteria was the same, regardless of the hand dryer used, when hands are kept still. When hands are rubbed together during drying, bacteria that live within the skin can be brought to the surface and transferred to other surfaces, along with surface bacteria that were not removed by handwashing. The researchers found the most effective way of keeping bacterial counts low, when drying hands, was using paper towels. Amongst the electric dryers, the model that rapidly stripped the moisture off the hands was best for reducing transfer of bacteria to other surfaces.

Dr Snelling says: "Good hand hygiene should include drying hands thoroughly and not just washing. The most hygienic method of drying hands is using paper towels or using a hand dryer which doesn't require rubbing your hands together."

### **Q & A**

#### **The Hair of My Chin**

**By C. CLAIBORNE RAY**

**Q.** If I tweeze out the single hair that grows from a facial mole, will it cause cancer, as my friend insists?

**A.** "No," said Dr. Mark D. Kaufmann, a dermatologist in Manhattan. "Even by cutting, you don't change the behavior of a mole."

Any mole can become cancerous, said Dr. Kaufmann, who is associate clinical professor in the department of dermatology at Mount Sinai School of Medicine, but one with a hair sprouting from it is actually less likely to do so. Such a mole is almost certainly what is called a congenital nevus, he said, and the hair indicates that the growth is way down in the skin, probably something that the person was born with.

Any mole that appears somewhere on the body where there was no mole before, or changes its appearance, should be checked by a dermatologist to make sure it is not in fact cancerous.

For melanoma, the deadliest form of skin cancer, important warning signs are often abbreviated as A, B, C and D: A for asymmetry, with one half of the mole different from the other half; B for border irregularity; C for uneven color; and D for diameter, a size greater than six millimeters (slightly less than a quarter of an inch) across.

### **Really?**

#### **The Claim: The Day's Events are Incorporated Into That Night's Dreams.**

**By ANAHAD O'CONNOR**

**THE FACTS** In the world of sleep research, dreams are something of a black box. But one tidbit that scientists have discerned is the peculiar but predictable pattern in which dreams tend to occur.

Research suggests that much of what happens in a dream is unique to that dream. But some events from a person's day can be incorporated into dreams in two stages.

First there is the "day residue" stage, in which emotional events may work their way into a person's dreams that night. But that is followed by the more mysterious "dream lag" effect, in which those events disappear

from the dream landscape - often to be reincorporated roughly a week later. This lag has been documented in studies dating to the 1980s.

A 2004 study in *The Journal of Sleep Research* began to shed some light on this cycle. Researchers reviewed the journals of 470 people who recorded their dreams over a week. The dream-lag effect was strongest among people who viewed their dreams as a chance for self-understanding; their dreams often involved the resolution of problems or emotions tied to relationships.

The researchers speculated that the delayed dreams were the mind's way of working through interpersonal difficulties and even "reformulating" negative memories into more positive ones. Other studies have also shown a connection between dreams and this type of emotional memory processing.

**THE BOTTOM LINE** The dream cycle can be much longer than a single night.

### **Losing weight may pollute the blood**

\* 09:30 07 September 2010 by **Wendy Zukerman**

Weight loss has a serious downside: it leads to the release of persistent organic pollutants (POPs), which may have a significant impact on health.

POPs are man-made chemicals which enter the food chain from sources including pesticides and manufacturing. They have been linked to an increased risk of diabetes, cancer and dementia.

Once consumed, POPs collect in fatty tissue, where they are not thought to be harmful. Now, Duk-Hee Lee of Kyungpook National University in Daegu, South Korea, has shown that weight loss causes POPs to be freed, leading to their build up in the blood.

Lee compared weight changes in 1100 adults over 10 years with seven POPs in their blood. People who had lost 10 kilograms or more during the decade had the highest levels of blood-borne POPs, while those who gained 10 kilograms or more had the lowest.

The level of POPs needed to have an adverse affect in humans is unknown, so it should not stop obese people trying to lose weight, says Amanda Sainsbury-Salis at the Garvan Institute of Medical Research in Sydney, Australia. *Journal reference: International Journal of Obesity, DOI: 10.1038/ijo.2010.188*

### **Extreme Survival: 'Conan the Bacterium' Reveals Its Recipe for Success**

ScienceDaily (Sep. 7, 2010) - Researchers report the discovery of long-sought chemical antioxidants in the world's toughest microbe - *Deinococcus radiodurans*. First studied nearly 50 years ago, this bacterium can survive massive exposures to gamma-radiation, ultraviolet radiation, desiccation, and other agents which kill cells by generating reactive oxygen species (ROS).

The study, headed by Michael J. Daly, Ph.D., professor at the Uniformed Services University of the Health Sciences (USU) Department of Pathology, appears in the September 3 edition of PLoS ONE.



***Long-sought chemical antioxidants in the world's toughest microbe has now been discovered. (Credit: Image courtesy of Uniformed Services University of the Health Sciences (USU))***

Daly's team previously reported that *D. radiodurans* accomplishes its astonishing survival feats in an unexpected way - by protecting its proteins from oxidation. This spares DNA repair enzymes from radiation damage and allows the cells to reassemble their broken genomes with extraordinary efficiency. The current study identifies divalent manganese-complexes in *D. radiodurans* cell extracts, which protect purified proteins, and *Escherichia coli* and human cells from extreme cellular insults caused by ionizing radiation. When bombarded by gamma-rays, *D. radiodurans* appears to salvage breakdown products of protein and DNA, endowing mixtures of peptides and orthophosphate with potent ROS-scavenging activities when combined with Mn(II).

When reconstituted, the Mn-complexes were immensely protective of irradiated enzymes, preserving their structure and function, but they did not protect DNA significantly. Prospectively, *D. radiodurans* has presented the scientific community with a novel and highly defensive chemical strategy to combat oxidative stress in diverse settings, including bioremediation of radioactive waste, preparation of irradiated vaccines, long-term protein storage, against ultraviolet rays during sunbathing, during radiotherapy and as we age.

The three-year project was a collaboration between Daly's group at USU, a team led by Dr. Rodney L. Levine, chief of the laboratory of biochemistry at the National Heart, Lung, and Blood Institute (NHLBI) at the National Institutes of Health and Drs. Juliann G. Kiang and Risaku Fukumoto at the Armed Forces Radiobiology Research Institute (AFRRI) in Bethesda, Md. Funding was by the Air Force Office of Scientific Research (AFOSR) and the intramural programs of the NHLBI and AFRRI.

## Colorful Mix of Asteroids Discovered, May Aid Future Space Travel

ScienceDaily (Sep. 7, 2010) - New research from NASA's Spitzer Space Telescope reveals that asteroids somewhat near Earth, termed near-Earth objects, are a mixed bunch, with a surprisingly wide array of compositions.

Like the chocolates and fruity candies inside a piñata, these asteroids come in assorted colors and compositions. Some are dark and dull; others are shiny and bright. The Spitzer observations of 100 known near-Earth asteroids demonstrate that their diversity is greater than previously thought.

The findings are helping astronomers better understand near-Earth objects as a whole - a population whose physical properties are not well known.

"These rocks are teaching us about the places they come from," said David Trilling, assistant professor of physics and astronomy at Northern Arizona University, and lead author of a new paper on the research appearing in the September issue of *Astronomical Journal*. "It's like studying pebbles in a streambed to learn about the mountains they tumbled down."



*This image, taken by NASA's Near Earth Asteroid Rendezvous mission in 2000, shows a close-up view of Eros, an asteroid with an orbit that takes it somewhat close to Earth. NASA's Spitzer Space Telescope observed Eros and dozens of other near-Earth asteroids as part of an ongoing survey to study their sizes and compositions using infrared light. (Credit: NASA/JHUAPL)*

One of the mission's programs is to survey about 700 near-Earth objects, cataloguing their individual traits. By observing in infrared, Spitzer is helping to gather more accurate estimates of asteroids' compositions and sizes than what is possible with visible-light alone.

Trilling and his team have analyzed preliminary data on 100 near-Earth asteroids so far. They plan to observe 600 more over the next year. There are roughly 7,000 known near-Earth objects out of a population expected to number in the tens to hundreds of thousands.

"Very little is known about the physical characteristics of the near-Earth population," Trilling said. "Our data will tell us more about the population, and how it changes from one object to the next. This information could be used to help plan possible future space missions to study a near-Earth object."

The data show that some of the smaller objects have surprisingly high albedos (a measurement of how much sunlight an object reflects). Since asteroid surfaces become darker with time due to exposure to solar radiation, the presence of lighter, shinier surfaces for some asteroids may indicate that they are relatively young. This is evidence for the continuing evolution of the near-Earth object population.

In addition, the asteroids observed so far have a greater degree of diversity than expected, indicating that they might have different origins. Some might come from the main belt between Mars and Jupiter, and others could come from farther out in the solar system. This diversity also suggests that the materials that went into creating the asteroids - the same materials that make up our planets - were probably mixed together like a big solar-system soup very early on in its history.

The research complements that of NASA's Wide-field Infrared Survey Explorer, or WISE, an all-sky infrared survey mission up in space now. WISE has already observed more than 430 near-Earth objects. Of these, more than 110 are newly discovered.

In the future, both Spitzer and WISE will reveal even more about the "flavors" of near-Earth objects. This could reveal new clues about how the cosmic objects might have dotted our young planet with water and organics - ingredients needed to jump-start life.

*Other authors include Cristina Thomas, a post-doctoral scholar of physics and astronomy at NAU, and researchers from around the world.*

## The Brain Speaks: Scientists Decode Words from Brain Signals

ScienceDaily (Sep. 7, 2010) - In an early step toward letting severely paralyzed people speak with their thoughts, University of Utah researchers translated brain signals into words using two grids of 16 microelectrodes implanted beneath the skull but atop the brain. "We have been able to decode spoken words using only signals from the brain with a device that has promise for long-term use in paralyzed patients who cannot now speak," says Bradley Greger, an assistant professor of bioengineering.

Because the method needs much more improvement and involves placing electrodes on the brain, he expects it will be a few years before clinical trials on paralyzed people who cannot speak due to so-called "locked-in syndrome."

The Journal of Neural Engineering's September issue is publishing Greger's study showing the feasibility of translating brain signals into computer-spoken words.

The University of Utah research team placed grids of tiny microelectrodes over speech centers in the brain of a volunteer with severe epileptic seizures. The man already had a craniotomy - temporary partial skull removal - so doctors could place larger, conventional electrodes to locate the source of his seizures and surgically stop them.

Using the experimental microelectrodes, the scientists recorded brain signals as the patient repeatedly read each of 10 words that might be useful to a paralyzed person: yes, no, hot, cold, hungry, thirsty, hello, goodbye, more and less.

Later, they tried figuring out which brain signals represented each of the 10 words. When they compared any two brain signals - such as those generated when the man said the words "yes" and "no" - they were able to distinguish brain signals for each word 76 percent to 90 percent of the time.

When they examined all 10 brain signal patterns at once, they were able to pick out the correct word any one signal represented only 28 percent to 48 percent of the time - better than chance (which would have been 10 percent) but not good enough for a device to translate a paralyzed person's thoughts into words spoken by a computer.

"This is proof of concept," Greger says, "We've proven these signals can tell you what the person is saying well above chance. But we need to be able to do more words with more accuracy before it is something a patient really might find useful."

People who eventually could benefit from a wireless device that converts thoughts into computer-spoken words include those paralyzed by stroke, Lou Gehrig's disease and trauma, Greger says. People who are now "locked in" often communicate with any movement they can make - blinking an eye or moving a hand slightly - to arduously pick letters or words from a list.

University of Utah colleagues who conducted the study with Greger included electrical engineers Spencer Kellis, a doctoral student, and Richard Brown, dean of the College of Engineering; and Paul House, an assistant professor of neurosurgery. Another coauthor was Kai Miller, a neuroscientist at the University of Washington in Seattle.

The research was funded by the National Institutes of Health, the Defense Advanced Research Projects Agency, the University of Utah Research Foundation and the National Science Foundation.

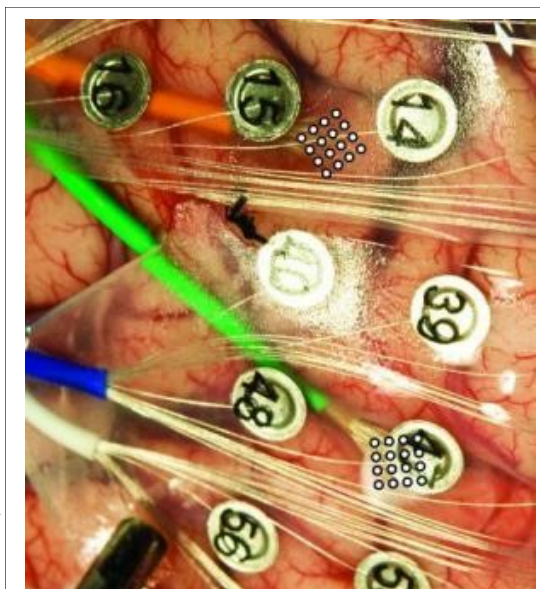
### **Nonpenetrating Microelectrodes Read Brain's Speech Signals**

The study used a new kind of nonpenetrating microelectrode that sits on the brain without poking into it. These electrodes are known as microECoGs because they are a small version of the much larger electrodes used for electrocorticography, or ECoG, developed a half century ago.

For patients with severe epileptic seizures uncontrolled by medication, surgeons remove part of the skull and place a silicone mat containing ECoG electrodes over the brain for days to weeks while the cranium is held in place but not reattached. The button-sized ECoG electrodes don't penetrate the brain but detect abnormal electrical activity and allow surgeons to locate and remove a small portion of the brain causing the seizures.

Last year, Greger and colleagues published a study showing the much smaller microECoG electrodes could "read" brain signals controlling arm movements. One of the epileptic patients involved in that study also volunteered for the new study.

Because the microelectrodes do not penetrate brain matter, they are considered safe to place on speech areas of the brain - something that cannot be done with penetrating electrodes that have been used in experimental devices to help paralyzed people control a computer cursor or an artificial arm.



*This photo shows two kinds of electrodes sitting atop a severely epileptic patient's brain after part of his skull was removed temporarily. The larger, numbered, button-like electrodes are ECoGs used by surgeons to locate and then remove brain areas responsible for severe epileptic seizures. While the patient had to undergo that procedure, he volunteered to let researchers place two small grids - each with 16 tiny "microECoG" electrodes - over two brain areas responsible for speech. These grids are at the end of the green and orange wire bundles, and the grids are represented by two sets of 16 white dots since the actual grids cannot be seen easily in the photo. University of Utah scientists used the microelectrodes to translate speech-related brain signals into actual words - a step toward future machines to allow severely paralyzed people to speak.*  
University of Utah Department of Neurosurgery

EEG electrodes used on the skull to record brain waves are too big and record too many brain signals to be used easily for decoding speech signals from paralyzed people.

### **Translating Nerve Signals into Words**

In the new study, the microelectrodes were used to detect weak electrical signals from the brain generated by a few thousand neurons or nerve cells.

Each of two grids with 16 microECoGs spaced 1 millimeter (about one-25th of an inch) apart, was placed over one of two speech areas of the brain: First, the facial motor cortex, which controls movements of the mouth, lips, tongue and face - basically the muscles involved in speaking. Second, Wernicke's area, a little understood part of the human brain tied to language comprehension and understanding.

The study was conducted during one-hour sessions on four consecutive days. Researchers told the epilepsy patient to repeat one of the 10 words each time they pointed at the patient. Brain signals were recorded via the two grids of microelectrodes. Each of the 10 words was repeated from 31 to 96 times, depending on how tired the patient was. Then the researchers "looked for patterns in the brain signals that correspond to the different words" by analyzing changes in strength of different frequencies within each nerve signal, says Greger.

The researchers found that each spoken word produced varying brain signals, and thus the pattern of electrodes that most accurately identified each word varied from word to word. They say that supports the theory that closely spaced microelectrodes can capture signals from single, column-shaped processing units of neurons in the brain.

One unexpected finding: When the patient repeated words, the facial motor cortex was most active and Wernicke's area was less active. Yet Wernicke's area "lit up" when the patient was thanked by researchers after repeating words. It shows Wernicke's area is more involved in high-level understanding of language, while the facial motor cortex controls facial muscles that help produce sounds, Greger says.

The researchers were most accurate - 85 percent - in distinguishing brain signals for one word from those for another when they used signals recorded from the facial motor cortex. They were less accurate - 76 percent - when using signals from Wernicke's area. Combining data from both areas didn't improve accuracy, showing that brain signals from Wernicke's area don't add much to those from the facial motor cortex.

When the scientists selected the five microelectrodes on each 16-electrode grid that were most accurate in decoding brain signals from the facial motor cortex, their accuracy in distinguishing one of two words from the other rose to almost 90 percent.

In the more difficult test of distinguishing brain signals for one word from signals for the other nine words, the researchers initially were accurate 28 percent of the time - not good, but better than the 10 percent random chance of accuracy. However, when they focused on signals from the five most accurate electrodes, they identified the correct word almost half (48 percent) of the time.

"It doesn't mean the problem is completely solved and we can all go home," Greger says. "It means it works, and we now need to refine it so that people with locked-in syndrome could really communicate."

"The obvious next step - and this is what we are doing right now - is to do it with bigger microelectrode grids" with 121 micro electrodes in an 11-by-11 grid, he says. "We can make the grid bigger, have more electrodes and get a tremendous amount of data out of the brain, which probably means more words and better accuracy."

### **Tuberculosis: Automated Test for Drug-Resistant TB Gives Results in Hours, Not Weeks**

**By DONALD G. McNEIL Jr.**

A new automated test for drug-resistant tuberculosis gives accurate results in two hours instead of four to eight weeks, scientists said last week, and public health officials greeted the news enthusiastically, saying it could greatly speed up diagnosis.

In the new test, known as Xpert MTB/RIF, a technician deposits a sputum sample in a cartridge, which is inserted into a machine. According to a study published online by The New England Journal of Medicine, the test is 98 percent accurate when compared with positive results from the old method - examination of sputum by a trained microscopist. It was only about 73 percent accurate on the hardest-to-analyze samples, but that is better than microscopy, which is wrong about half the time. And it was 98 percent accurate in detecting antibiotic resistance, the step that adds weeks to the old process.

The test was developed by Cepheid, a private company, and the Foundation for Innovative New Diagnostics in Switzerland, with support from the National Institutes of Health and the Bill & Melinda Gates Foundation.

It has some limitations. The machines cost \$30,000 and each test is about \$60, which means poor countries, where the TB problem is the worst, will have to rely on donors to supply it. And it detects resistance to only one antibiotic, rifampicin. Rifampicin resistance is a useful signal that a patient has a dangerous drug-resistant strain, but does not tell the whole story.

## Microbes are eating BP oil without using up oxygen

By **SETH BORENSTEIN** AP Science Writer

WASHINGTON (AP) - Government scientists studying the BP disaster are reporting the best possible outcome: Microbes are consuming the oil in the Gulf without depleting the oxygen in the water and creating "dead zones" where fish cannot survive. Outside scientists said this so far vindicates the difficult and much-debated decision by BP and the government to use massive amounts of chemical dispersants deep underwater to break up the oil before it reached the surface. Oxygen levels in some places where the BP oil spilled are down by 20 percent, but that is not nearly low enough to create dead zones, according to the 95-page report released Tuesday.

In an unusual move, BP released 771,000 gallons of chemical dispersant about a mile deep, right at the spewing wellhead instead of on the surface, to break down the oil into tiny droplets.

The idea was to make it easier for oil-eating microbes to do their job. But the risk was that the microbes would use up the oxygen in the water. So BP had to perform a delicate balancing act.

"Has it hit the sweet spot? Yes. Was it by design? Partly," said Steve Murawski, the National Oceanic and Atmospheric Administration senior scientist who headed the federal team of researchers.

One reason that oxygen levels didn't drop too low was the natural mixing of water in the Gulf, which kept bringing in oxygen from other areas, Murawski said. Oxygen levels would have had to fall by three-quarters for the water to be classified as a dead zone, he said.

The Gulf of Mexico already has a yearly major problem with a natural dead zone - this year, it is the size of Massachusetts - because of farm runoff coming down the Mississippi River. Fertilizer in the runoff stimulates the runaway growth of algae, depleting the oxygen in a giant patch of the Gulf every summer.

Federal officials had been tracking oxygen levels and use of dispersants since the spill, which spewed more than 200 million gallons of oil into the Gulf between April and July. Had the oxygen plummeted near dangerous levels, the dispersant use would have been stopped, said Greg Wilson, science adviser at the Environmental Protection Agency's emergency management office.

The use of dispersants has been a source of fierce debate because it involves an environmental trade-off: protecting the shoreline from oil at the risk of causing unknown problems in the deep. While dispersants make it easier for bacteria to degrade the oil, they tend to hide oil below the surface. There have also been concerns about the chemicals' toxicity and the long-term effects on marine life.

In May, the federal government convened about 50 scientists for advice on whether to continue using the dispersants. Though the researchers were divided before the meeting, they unanimously recommended continuing with the chemicals, said University of California Davis oil spill scientist Ron Tjeerdema.

"The best of two options - neither of which were great - was to continue dispersing," Tjeerdema said.

Louisiana State University researcher Ed Overton, who also was part of that meeting, said he feels vindicated. "Right now it looks like an incredibly good idea," he said. "It was a risky but necessary application. Damage was going to be done somewhere."

But Overton said it may be years before scientists know if there is long-term damage from the dispersants.

Last month, after federal officials said much of the oil had dissolved, dispersed or evaporated, outside researchers were skeptical. Two new studies called that into question, finding that invisible underwater plumes of oil remained deep underwater.

But Tuesday's report dovetails with another outside study, published last month, announcing the discovery of a new oil-consuming microbe in the Gulf that was flourishing on BP's spill. The sagging oxygen levels also lend more weight to the government's claims last month that microbes are consuming oil, because there would be no dip in oxygen if the bacteria weren't feeding on the BP leftovers, Murawski said.

The new work is based on data collected from May through August at 419 locations by nine government and private research ships in the Gulf.

Larry McKinney, director of a Gulf of Mexico research center at Texas A&M University in Corpus Christi, said the new federal data showed that it was a "nearly perfect" outcome. "They hit it on the head, which is good," said McKinney, who was not involved in the report. *Online: NOAA report: <http://tinyurl.com/39cbbs4>*

### Even Bugs Have Personality

***Individual bugs behave consistently and in their own unique ways over time and across different contexts, research finds.***

By [Jennifer Viegas](#) Tue Sep 7, 2010 07:00 PM ET

Individual insects and bugs may all look alike to human eyes, but each and every one is unique and possesses its own personality, suggests new research that also helps to explain how personality arises in virtually all organisms. Some individual bugs, like humans, turn out to be shy, while others are very forceful, determined the study, published in the latest *Proceedings of the Royal Society B*.

"Boldness, explorativeness, activity and aggressiveness are the main personality traits usually measured because these connect to each other and appear together," lead author Eniko Gyuris told Discovery News.

What makes a bug bold or shy? Gyuris explains the traits manifest themselves a bit differently in insects.

"Boldness - whether they are shier or braver - could be defined, for example, as to how quickly they start after an alarm, or how soon they come out of their refuge," added Gyuris, a member of the Behavioral Ecology Research Group at the University of Debrecen. "Explorativeness could be measured in another context, namely in which they have the opportunity to discover a new environment with novel objects."



***It turns out even humble bugs, like these firebugs, show signs of individual personalities.*** Eniko Gyuris

Gyuris and his team conducted personality tests on short-winged and long-winged firebugs, a common insect that's known for its striking red and black coloration. The researchers collected these bugs from wild populations in Debrecen, Hungary, and put them through a barrage of different situations.

In one experiment, an individual firebug was placed in a covered vial that was moved to a small, lit circular arena. Four colored plugs made of gum were arranged on the arena's floor to serve as objects for each bug to explore. The scientists then tapped the vial and removed the cover, noting how long it took for the insect to leave its protective container and explore its new surroundings.

The researchers also shook the bugs out of their vials and into the arena. The scientists recorded how many objects each firebug explored, how fast the bug moved, how long it took to reach the wall of the arena, and more. All experiments were repeated four times per bug.

Each individual firebug behaved in a unique manner that was consistent across all of the experiments. If a particular bug was classified as bold and brave, it acted that way under a variety of circumstances. The same held true for more tentative, less aggressive firebugs. Females tended to show more extreme reactions, with long-winged firebugs acting bolder than short-winged ones.

The scientists believe their findings carry over to other bugs and animals, with genes, gender, life experiences, environmental conditions and other factors shaping personality.

"I think nearly every individual - insects and other organisms alike - has his or her own personality, with the possible exception of the ones living in very specific and stable habitats for a long time, like a cave, for example, as they may not need to behave in different ways among conspecifics," Gyuris explained.

Raine Kortet, a University of Helsinki researcher, and colleague Ann Hedrick discovered that personalities are all over the chart for field crickets, particularly among males. Some are veritable daredevils, while others are passive and guarded. Kortet and Hedrick concluded that "more aggressive males are also more active in general, and possibly less cautious towards predation risk."

Prior research by Kortet also found that dominant male crickets are more attractive to females, with dominance possibly tied to better immune defense and certain beneficial genes.

But boldness isn't always better.

"Some traits can be beneficial in one context" but not in another, Gyuris indicated.

A brazen male bug that may be hearty and popular with females due to boldness, for example, could display aggressive behavior around an annoyed human and get squished in the process.

### **Study of Men Dancing Reveals Moves Ladies Love**

By [Charles Q. Choi](#), LiveScience Contributor posted: 07 September 2010 07:06 pm ET

Using computer-generated avatars, psychologists say they have unlocked the dance moves that will capture a woman's heart. Apparently the speed of a man's right knee and the size and variety of movements of the neck and torso are key, they suggest.

Throughout the animal kingdom examples abound of [males performing courtship dances](#), attracting females with displays of health and skill. Dances are sexy among humans as well, and scientists wanted to codify what moves ladies like to see in men.

Psychologists at Northumbria University in England filmed 19 male volunteers, ages 18 to 35, with a 12-camera system as the [men danced to a German dance track](#), the kind of drum rhythm one might hear clubbing. None of them were professional dancers.

The men also wore 38 small reflectors all over their body, which the systems monitored to capture the motions of the dancers in three dimensions - the same technique filmmakers used to help create the character of

Gollum in the "Lord of the Rings" movies. These movements were mapped onto featureless, white, gender-neutral humanoid characters, or avatars.

This way, the 35 heterosexual women the scientists also recruited could rate 15-second clips of each dancer without being prejudiced by each guy's individual level of physical attractiveness. Each dancer was judged on a scale of one to seven, from extremely bad to extremely good.

Guys whose swagger included larger and more variable movements of the neck and torso were considered attractive by the ladies.

"This is the first study to show objectively what [differentiates a good dancer](#) from a bad one," said researcher Nick Neave, a psychologist at Northumbria University. "Men all over the world will be interested to know what moves they can throw to attract women."

Curiously, faster bending and twisting movements of the right knee also seemed to catch the eyes of women. As a potential explanation, the researchers noted that 80 percent of all people are right-footed, so most people "are putting their weight on their left leg and using that leg as an anchor while the right can do more fancy things," Neave suggested. "It is a bit of an odd finding, so we need more studies to see if this feature is replicated."

He added: "We now know which area of the body females are looking at when they are making a judgment about male dance attractiveness. If a man knows what the key moves are, he can get some training and improve his [chances of attracting a female](#) through his dance style."

In the online version of the journal *Biology Letters* Sept. 8, the researchers suggest these dance movements could be signs of male health, vigor or strength that men would find hard to fake. Neave said they have preliminary data to show that [better dancers are also healthier](#) and are more attractive, and they are exploring these ideas in current research studies.

"The hardest thing is to recruit males to take part," Neave told LiveScience. "They seem rather reluctant to sign up for studies that involve dancing."

Male avatars reveal the dance moves that ladies like, including moves with more twisting and bending of a guy's knee and larger head and torso movements.

### **Optical Illusion of Child Gets Drivers to Brake**

**Analysis by Tracy Staedter** Wed Sep 8, 2010 07:50 AM ET

I don't know about you, but my heart skips a beat if I see a ball suddenly roll out into the street in front of my car. I'm on the brake as fast as I can.

It's a reaction that the British Columbia Automobile Association Traffic Safety Foundation is hoping lots of people have. In an effort to get speeding drivers to slow down, they're painting an image of a child playing with a ball on the road in a school zone. The image is painted in an elongated manner, so that at the right distance, it appears three-dimensional.

It reminds me of those paintings you see from sidewalk artists who can recreate the edge of a cliff or a stairwell. From far away, this image looks like a smudge. But as the driver gets closer, the form of a child comes into view. The faster the car, the more suddenly the image will pop up into a three-dimensional view. A nearby sign will read, "You're probably not expecting kids to run into the road."

The illusion is being trialed in West Vancouver, Canada, starting September 7, and will be removed after a week of evaluation.

I think this is a great example of how a simple approach could potentially solve a big problem. Safety, or other, challenges don't always require a high-tech solution. (Although I must admit, I would love to see 3D holograms used one day to keep people alert on the roads.) My guess is that the illusion will work well, as long as drivers aren't preoccupied with text messaging.

### **Designing Your Own Workspace Improves Health, Happiness and Productivity**

Employees who have control over the design and layout of their workspace are not only happier and healthier - they're also up to 32% more productive, according to new research from the University of Exeter in the UK.

Studies by the University's School of Psychology have revealed the potential for remarkable improvements in workers' attitudes to their jobs by allowing them to personalise their offices.

The findings challenge the conventional approach taken by most companies, where managers often create a 'lean' working environment that reflects a standardized corporate identity.





Dr Craig Knight conducted the research as part of his PhD and is now Director of PRISM - a company that deals with space issues in the workplace. He said "Most contemporary offices are functional and offer very little user control, but our studies suggest this practice needs to be challenged.

"When people feel uncomfortable in their surroundings they are less engaged - not only with the space but also with what they do in it. If they can have some control, that all changes and people report being happier at work, identifying more with their employer, and are more efficient when doing their jobs."

The research involved more than 2,000 office workers in a series of studies looking at attitudes to - and productivity within - working space. This included two surveys of workers' attitudes carried out via online questionnaires, as well as two experiments which examined workers' efficiency when carrying out tasks under different conditions.

The surveys assessed the level of control workers had over their space - ranging from none at all to being fully consulted over design changes. Workers were then asked a series of questions about how they felt about their workspace and their jobs.

Results consistently showed that the more control people had over their office spaces, the happier and more motivated they were in their jobs. They felt physically more comfortable at work, identified more with their employers, and felt more positive about their jobs in general.

Two further studies, one at the University and another in commercial offices saw participants take on a series of tasks in a workspace that was either lean (bare and functional), enriched (decorated with plants and pictures), empowered (allowing the individual to design the area) or disempowered (where the individual's design was redesigned by a 'manager'). People working in enriched spaces were 17% more productive than those in lean spaces, but those sitting at empowered desks were even more efficient - being 32% more productive than their lean counterparts without any increase in errors.

Professor Alex Haslam, who co-authored the research, said it was time for managers to recognise the potential improvements that can be made by handing some control of space over to workers and thereby giving them an opportunity to realise their own identity in the workplace.

He said: "Not only does office design determine whether people's backs ache, it has the potential to affect how much they accomplish, how much initiative they take, and their overall professional satisfaction. Further research that we and others have carried out also highlights strong links between a lack of control over workspace and sickness in the office.

"All this could have a huge impact for firms of any size, yet employers rarely consider the psychological ramifications of the way they manage space. By paying more attention to employees' needs they can boost wellbeing and productivity at minimal cost."

The research was carried out with the help of Ambius, a firm which specialises in providing services to enrich workspaces for businesses and was jointly funded by the Economic and Social Research Council (ESRC).

Kenneth Freeman, Ambius' International Technical Director said: "This research shows that the spaces in which people work are hugely important to the way they do their jobs. It is clear that by working with employees to enrich workspace, businesses can help their workers to feel engaged and inspired, and this has clear benefits in helping companies grow and achieve their aims."

*Story Source: The above story is reprinted (with editorial adaptations by ScienceDaily staff) from materials provided by University of Exeter.*

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### **Extinction 'Tipping Points' Possibly Predictable**

**By Stephanie Pappas**, LiveScience Senior Writer 08 September 2010 01:09 pm ET

Thousands of plants and animals worldwide are listed as threatened or endangered, but the point of no return for these diminishing populations has been impossible to predict. A new study suggests a way to determine when extinction becomes inevitable.

If the findings from a laboratory experiment prove applicable in nature, they could help ecologists step in to save species before it's too late, researchers say. For now, the study is the first step in moving a mathematical theory into the real world, where endangered species are vanishing at a rate that may range from 10 to 100 times the so-called background extinction rate. [\*\[Read "Mass Extinction Threat: Earth on Verge of Huge Reset Button?"\]\*](#)

When ecologists model the decline of species (a computer simulation of sorts), they see tipping points - sets of circumstances that make extinction all but certain.

To date, mathematical modeling has revealed a few statistical harbingers of tipping points. Right before a system reaches the point of no return, it goes through a phase called "critical slowing down." That phase is the statistical equivalent of the gut feeling you may experience right before a canoe tips over or a rollercoaster makes a plunge: that the system can no longer recover from perturbations in the environment (like your last-minute attempt to balance the canoe), and a dramatic change is imminent.

In nature, those perturbations might be small changes in temperature or precipitation, or simple normal fluctuations in how many offspring a species produces.

"The ability of the system to respond to perturbations, to these little nudges, is diminished," study researcher John Drake, an ecologist at the University of Georgia, told LiveScience. "So lots of little nudges accumulate, and that's what we call critical slowing down."

To find out if critical slowing down can predict extinction in real-world ecosystems, Drake and Blaine Griffen of the University of South Carolina used millimeters-long crustaceans called water fleas. The tiny algae-eaters were split into two groups and fed until their population stabilized. After about 150 days, the researchers stopped feeding one of the groups.

Unsurprisingly, the starving water fleas struggled to survive. By day 416, all populations in their group were extinct. By analyzing the population fluctuations as the water fleas slid toward extinction, the researchers found that critical slowing down did occur. In fact, the statistical warning signs of extinction showed up eight generations, or 110 days, before the last water fleas perished.

### **From laboratory to field**

Translating the laboratory results to the field is likely to be difficult. Natural systems are much more complex than a limited number of water fleas in a controlled lab setting. And careful monitoring and analysis will be necessary to get the data that might be used to predict extinction.

Even if extinction can be predicted, ecologists would need to figure out how to reverse the problem in lots of different ecosystems.

"A great deal of system-specific knowledge is going to be needed to apply these things in any sort of real-world setting," said ecologist Stephen Carpenter, the director of the Center for Limnology at the University of Wisconsin. "That's not a criticism, it just says we have more work to do."

The fact that Drake and Griffen were able to demonstrate the statistical precursors to extinction in living organisms "adds momentum" to the idea of replicating the results in the field, said Carpenter, who was not involved in the study.

Drake agrees. "Our contribution was to experimentally demonstrate critical slowing down in a biological population," he said. "Now it remains to see whether we can scale that up to applications in nature."

### **Personality Predicts Cheating More Than Academic Struggles, Study Shows**

Students who cheat in high school and college are highly likely to fit the profile for subclinical psychopathy - a personality disorder defined by erratic lifestyle, manipulation, callousness and antisocial tendencies, according to research published by the American Psychological Association. These problematic students cheat because they feel entitled and disregard morality, the study found.

Cheating, a perennial concern for educators, "has been facilitated by new technologies," said Delroy Paulhus, PhD, who led the research. "At the same time, cheating may seem more apparent because we can more effectively detect it." Because it's hard or even dangerous to try to reform a psychopathic person, he recommends blocking cheating using other means.

College students who admitted to cheating in high school or turned in plagiarized papers ranked high on personality tests of the so-called Dark Triad: psychopathy, Machiavellianism (cynicism, amorality, manipulateness), and narcissism (arrogance and self-centeredness, with a strong sense of entitlement). Of the three dark personality types, psychopathy was most strongly linked to cheating. These findings appear in the September Journal of Experimental Psychology: Applied.

Students were spurred to cheat by two motivations, the research found: First, they sought to get the grades to which they felt entitled; second, they either didn't think cheating was wrong or didn't care.

The first of three studies at the University of British Columbia surveyed 249 second-year college students who, without having to share their identities, filled out take-home personality tests that looked at the Dark Triad and psychology's "Big Five" core traits of extraversion, agreeableness, conscientiousness, stability and openness.

Also anonymously, students were asked whether they had cheated on high-school tests or handed in essays copied from someone else. (Questions specifically referred to high school to allay concerns about admitting to cheating at the university.)

Each of the Dark Triad variables went hand in hand with cheating at a high level of statistical significance. The more likely students were to have cheated, the higher they ranked on the psychopathy scale, followed by Machiavellianism and narcissism.

Students who were more conscientious and agreeable were significantly less likely to have cheated. Those low in conscientiousness were probably more likely to cheat because they were less prepared and more desperate, the authors wrote, adding that disagreeable students would by definition be less cooperative. However, the predictive power of those two core traits paled next to those of the Dark Triad.

A second study measured actual, not self-reported, cheating by analyzing two of each student's term papers - one summarizing a research topic and one summarizing a personal experience. The students, who took the same personality tests, were warned that their papers would be scrutinized by an online service that calibrates how much of a paper directly matches sources in a database. Plagiarism was flagged when any string of seven words or more directly matched a published source or another finished paper.

Of the 114 students studied, 16 plagiarized on at least one essay. Again, the Dark Triad and plagiarism were closely and significantly linked, with psychopathy leading the pack. Although for the essay, poor verbal skills were also tied to cheating, the association with psychopathy was tighter still.

With both the self-report and the plagiarism screen detecting cheating, the authors concluded that personality profiling can help predict cheating.

Finally, a third study examined why students cheat. A total of 223 college students went online to take personality tests and rate themselves on a Self-Report Cheating Scale that included items tapping motivation, such as "I needed to get (or keep) a scholarship," or "I'm not concerned about punishment if caught."

Analysis unearthed subgroups of students who felt that cheating was an appropriate strategy for reaching their ambitious goals, who were not afraid of punishment, or who were not morally inhibited. Psychopathy was significantly linked with all three motivations.

"Incentives such as high grades and scholarships seem to activate dishonesty in these individuals," the authors wrote. "The achievement goals shared by most college students trigger cheating in psychopaths alone." Making it worse, moral deterrents don't matter to psychopaths, who scoff at social norms.

The authors caution that subclinical psychopaths are unlikely to exhibit the extreme behaviors of criminal psychopaths. Even with subclinical levels, however, it's nearly impossible and potentially dangerous to intervene with psychopaths. To foil the natural cheaters, the authors recommend that teachers use different forms of the same test, ban cell phones and other electronics, use random or assigned seats, ask for essays about personal experiences (which are not easily duplicated), and use plagiarism screening software.

To a lesser extent, educators can expect that students who aren't well prepared are also more likely to cheat. The authors suggest that making a classroom less competitive could avoid tempting the weaker students.

*Story Source:* The above story is reprinted (with editorial adaptations by ScienceDaily staff) from materials provided by American Psychological Association, via EurekAlert!, a service of AAAS.

*Journal Reference:* 1. Kevin M. Williams, PhD, Craig Nathanson, PhD, and Delroy L. Paulhus, PhD. Identifying and Profiling Scholastic Cheaters: Their Personality, Cognitive Ability, and Motivation. *Journal of Experimental Psychology: Applied*, Vol. 16, No. 3 DOI: 10.1037/a0020773

## **The Other End of the Planetary Scale**

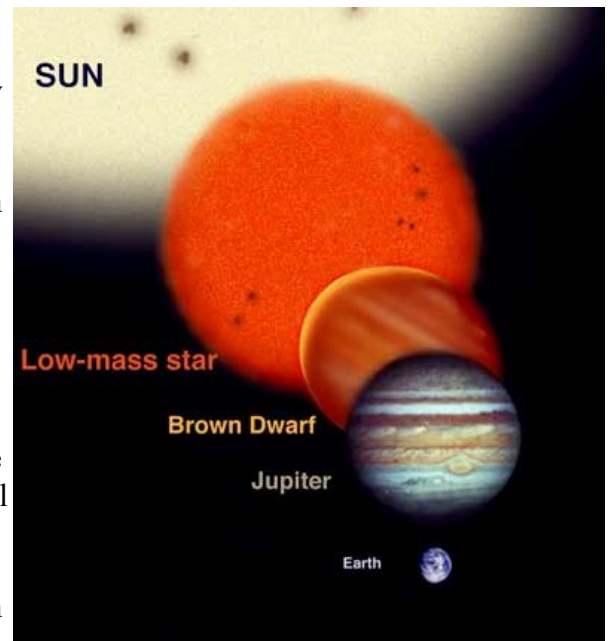
Posted in: Astronomy **by Jon Voisey**

The definition of a "planet" is one that has seen a great deal of contention. The ad-hoc redefinition has caused much grief for lovers of the demoted Pluto. Yet little attention is paid to the other end of the planetary scale, namely, where the cutoff between a star and a planet lies. The general consensus is that an object capable of supporting deuterium (a form of hydrogen that has a neutron in the nucleus and can undergo fusion at lower temperatures) fusion, is a brown dwarf while, anything below that is a planet. This limit has been estimated to be around 13 Jupiter masses, but while this line in the sand may seem clear initially, a new paper explores the difficulty in pinning down this discriminating factor. For many years, brown dwarfs were mythical creatures. Their low temperatures, even while undergoing deuterium fusion, made them difficult to detect. While many candidates were proposed as brown dwarfs, all failed the discriminating test of having lithium present in their spectrum (which is destroyed by the temperatures of traditional hydrogen fusion). This changed in 1995 when the first object of suitable mass was discovered when the 670.8 nm lithium line was discovered in a star of suitable mass.

Since then, the number of identified brown dwarfs has increased significantly and astronomers have discovered that the lower mass range of purported brown dwarfs seems to overlap with that of massive planets. This includes objects such as CoRoT-3b, a brown dwarf with approximately 22 Jovian masses, which exists in the terminological limbo.

The paper, led by David Spiegel of Princeton, investigated a wide range of initial conditions for objects near the deuterium burning limit. Among the variables included, the team considered the initial fraction of helium, deuterium, and "metals" (everything higher than helium on the periodic table). Their simulations revealed that just how much of the deuterium burned, and how fast, was highly dependent on the starting conditions. Objects starting with higher helium concentration required less mass to burn a given amount of deuterium. Similarly, the higher the initial deuterium fraction, the more readily it fused. The differences in required mass were not subtle either. They varied by as much as two Jovian masses, extending as low as a mere 11 times the mass of Jupiter, well below the generally accepted limit.

The authors suggest that because of the inherent confusion in the mass limits, that such a definition may not be the "most useful delineation between planets and brown dwarfs." As such, they recommend astronomers take extra care in their classifications and realize that a new definition may be necessary. One possible definition could involve considerations of the formation history of objects in the questionable mass range; Objects that formed in disks, around other stars would be considered planets, where objects that formed from gravitational collapse independently of the object they orbit, would be considered brown dwarfs. In the mean time, objects such as CoRoT-3b, will continue to have their taxonomic categorization debated.



*A comparison of the size of Jupiter, a brown dwarf, a small star and the Sun (Gemini Observatory/Artwork by Jon Lomberg)*

## **Using Chest Compressions First Just as Successful as Immediate Defibrillation After Cardiac Arrest**

Chest compressions before defibrillation in patients with sudden cardiac arrest is equally successful as immediate treatment with an electrical defibrillator, according to a new study by the University of Michigan Health System.

Few people who suffer cardiac arrest outside of a hospital survive. U-M physicians, along with a team of international experts, examined two promising rescue strategies: chest compressions first vs. defibrillation first.

Their results, published online in BMC Journal, show that both timing strategies are effective, yet chest compressions before defibrillation may be best in events where emergency response times are longer than five minutes.

"Current evidence does not support the notion that chest compressions first prior to defibrillation improves the outcome of patients in out-of-hospital cardiac arrest; instead it appears that both treatments are equivalent," says lead study author Pascal Meier, M.D., an interventional cardiologist at the U-M Cardiovascular Center.

One-year survival rates were higher among those who had chest compressions first. Data also suggests chest compressions may benefit cardiac arrests with a prolonged response time.

The study pooled data from four randomized trials that included a total of 1,503 patients. Researchers compared patient survival rates after emergency medical service providers performed at least 90 seconds of chest compressions before electrical defibrillation.

"The compressions-first approach appears to be as good as the defibrillation-first approach, especially if there are delays to EMS arriving on-scene," says senior author Comilla Sasson, M.D., an emergency medicine physician researcher at the University of Colorado. "This has major policy implications."

Sasson continues: "Our study shows that chest compressions matter so even more emphasis should be placed on doing high-quality chest compressions both by laypeople providing bystander CPR and EMS providers."

Sasson worked on the study while at the U-M where she created a body of work focused on out-of-hospital cardiac arrest and resuscitation, including demographic and racial differences in cardiac arrest survival.

EMS providers assess approximately 300,000 people with cardiac arrest in the United States each year. Only about 8 percent of people who have sudden cardiac arrest outside of a hospital survive. There's an urgent need to find ways to save lives of those whose heart has suddenly stopped beating.

When administered as soon as possible, chest compressions in conjunction with cardiopulmonary resuscitation, and, in some cases, rapid treatment with a defibrillator - a device that sends an electric shock to the heart to try to restore its normal rhythm - can be lifesaving. When delivered by EMS professionals, CPR is a

combination of rescue breathing and chest compressions to keep oxygen-rich blood circulating until an effective heartbeat is restored. Bystanders are encouraged to immediately begin CPR using only chest compressions until professional help arrives, according to the American Heart Association. In the coming weeks, the AHA is expected to launch its 2010 guidelines for CPR and emergency cardiovascular care. "Based on our study, current guidelines emphasizing early defibrillation still are important," Meier says.

"However, since the outcomes with the chest compression-first approach were not inferior and might be even better in the long-term, and in case of longer response times, this study may have an impact on future guidelines."

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*Reference: "Chest compressions before defibrillation for out of hospital cardiac arrest: A meta-analysis of randomized controlled clinical trials," BMC Journal.*

*Funding: The study was supported by a research grant of the Swiss National Science Foundation.*

## **Molecular Gatekeeper of Arthritis Identified: Removal of Key Protein Leads to Initiation of Disease**

Elimination of a molecular gatekeeper leads to the development of arthritis in mice, scientists report in a study published in *The Journal of Experimental Medicine*. The newly discovered gatekeeper is a protein that determines the fate -- survival or death -- of damaging cells that mistakenly attack the body's own tissues and lead to autoimmune disorders such as arthritis.

Better understanding how arthritis develops will offer scientists an opportunity to explore new types of treatments for patients whose arthritis has not been effectively treated with current therapies.

"This finding is an encouraging step forward for researchers, clinicians and arthritis sufferers, many of whom fail available therapies," said lead researcher Frances Lund, Ph.D., professor of Medicine in the Division of Allergy/Immunology and Rheumatology at the University of Rochester Medical Center. "An added bonus is that this finding may help in the search for new treatments for other autoimmune disorders, such as lupus."

The protein at the center of the new finding, known as Gαq (G alpha q), is part of a larger signaling pathway that Lund and collaborators from across the United States and China investigated in mice. Gαq regulates B cells, one type of immune cell that the body maintains to fight off invaders like bacteria, viruses and parasites. While most B cells help defend the body, some B cells are autoreactive -- they turn against the body's own tissues.

In mice, Gαq normally stops autoreactive B cells from building up in tissues by suppressing the pro-survival signaling pathway uncovered by Lund's team. When Gαq is eliminated, autoreactive B cells are able to pass through internal 'checkpoints' that typically get rid of these harmful cells, creating a buildup of the cells that contributes to the development of autoimmune disease.

Several new studies expanding on the current finding are in the works, including testing whether drug compounds that alter the expression or activity of Gαq in mice can slow the development of autoimmunity. Beyond preclinical testing in mice, researchers also hope to start screening Gαq levels in patients to learn more about how the protein works in humans.

According to Lund, "There is a subset of cardiac patients who, due to an inherited genetic mutation, have increased levels of Gαq. We are now looking to see if some arthritis patients have mutations that favor decreased levels of Gαq. If we find these patients, someday we may be able to design targeted, personalized therapy for this subpopulation of arthritis sufferers."

"In the past few decades, nearly all of the really important advances in rheumatology have started with basic studies like this one," said Richard John Looney, M.D., a rheumatologist and professor of Medicine at the University of Rochester Medical Center. "I will be particularly interested in the translational studies that will be starting soon, as they may result in new applications such as assessing the risk someone may develop lupus or other autoimmune diseases."

Lund's research also led to the creation of a new mouse model of arthritis. By eliminating Gαq, the disease just happens in mice, as opposed to previous mouse models which require injecting an antigen or foreign body, such as collagen, into mice to trigger an immune response. The new model more closely mirrors how autoimmunity starts and progresses in humans, and may be used in the future to test new drugs in development.

"Our goal is to move the knowledge we've gained from basic research to meaningful results that will ultimately help patients, and our main finding coupled with the creation of an improved mouse model puts us in a very strong position to do that," said Lund.

As with many discoveries, the new finding came about unexpectedly. Scientists in Lund's lab were looking at cell migration to try to identify the molecular signals that cause inflammation in tissues in *Gαq* knockout mice. They noticed that as they grew older, the mice's joints swelled and it appeared as though they were getting arthritis. Lund's team pursued the lead, which led to the discovery of the protein's role in the development of the disease and the creation of the new mouse model.

*In addition to Lund, Ravi Misra, Ph.D., Betty Mousseau, Kim Kusser, and Troy Randall, Ph.D., from the University of Rochester Medical Center contributed to the research. Scientists from Sichuan University, China, the University of Washington, Seattle Children's Research Institute, the Trudeau Institute, the University of Massachusetts Medical School, and the University of California, San Diego, School of Medicine were also part of the research team. Biogen Idec and Human Genome Sciences provided biologic drugs that were used to test whether B cells in the *Gαq* deficient mice were responsible for causing arthritis in the mice.*

*The research was funded by the National Institute of Allergy and Infectious Disease at the National Institutes of Health and the University of Rochester Medical Center.*

### **Oxygen production may have begun 270 million years earlier**

(PhysOrg.com) -- Bacteria that produce oxygen may have evolved hundreds of millions of years earlier than previously thought, a new study into ancient rock formations in Western Australia suggests.

Well-preserved fossils of stromatolites in the Tumbiana Formation, in the Pilbara region, have been dated as 2.72 billion years old, more than 270 million years older than the previous oldest evidence of oxygenic photosynthesis, UNSW doctoral student David Flannery has told a symposium in Perth.

Flannery and other researchers from UNSW's Australian Centre for Astrobiology (ACA) and Macquarie University presented their findings at the Fifth International Archean Symposium, in a paper titled "Does the Neoarchaeon Fortescue group record the earliest evidence for oxygenic photosynthesis?"



*Modern stromatolites at Shark Bay, WA*

They note that most scientists accept that Earth's atmosphere became oxygenated - and thus habitable for other forms of life - during a period known as the Great Oxidation Event around 2.45 and 2.32 billion years ago. Blue-green algae, or cyanobacteria, are thought to have been the first organisms to do so, and they lived in colonies that left behind the stromatolite fossils.

But when oxygen-producing organisms first evolved and how long it took the resulting oxygenation of the atmosphere has been uncertain. The new findings may suggest the process not only started earlier but was more extended and gradual than previously thought, according to co-author Professor Malcolm Walter, director of the ACA.

"The formerly neat story of the Great Oxidation Event now seems not to be so neat after all," Professor Walter says. "The idea that the Earth's atmosphere suddenly became oxygenated about 2.45 billion years ago now seems too simple."

He cautions that the new study is still in its early stages, relying on fossilised rock structures and chemical evidence rather than definitive cellular structures: "It's early days yet and what we have found is not unequivocal evidence, but stromatolites are very distinctive and these structures are identical with those of living stromatolites we're studying at Shark Bay, in Western Australia. I'm confident enough in what we've found." *Provided by University of New South Wales*

### **Vitamin B 'puts off Alzheimer's'**

**By Jane Hughes** Health correspondent, BBC News

A new study suggests high doses of B vitamins may halve the rate of brain shrinkage in older people experiencing some of the warning signs of Alzheimer's disease.

Brain shrinkage is one of the symptoms of mild cognitive impairment, which often leads to dementia.

Researchers say this could be the first step towards finding a way to delay the onset of Alzheimer's.

Experts said the findings were important but more research was needed.

The study, published in the journal *Public Library of Science One*, looked at 168 elderly people experiencing levels of mental decline known as mild cognitive impairment.

This condition, marked by mild memory lapses and language problems, is beyond what can be explained by normal ageing and can be a precursor to Alzheimer's and other forms of dementia.

Half of the volunteers were given a daily tablet containing levels of the B vitamins folate, B6 and B12 well above the recommended daily amount. The other half were given a placebo.

After two years, the rate at which their brains had shrunk was measured.

The average brain shrinks at a rate of 0.5% a year after the age of 60. The brains of those with mild cognitive impairment shrink twice as fast. Alzheimer's patients have brain shrinkage of 2.5% a year.

The team, from the Oxford Project to Investigate Memory and Ageing (Optima), found that on average, in those taking vitamin supplements, brain shrinkage slowed by 30%.

John Hough: "You become more forgetful and annoyed with yourself"

In some cases it slowed by more than 50%, making their brain atrophy no worse than that of people without cognitive impairment.

### **'Protecting' the brain**

Certain B vitamins - folic acid, vitamin B6 and B12 - control levels of a substance known as homocysteine in the blood. High levels of homocysteine are associated with faster brain shrinkage and Alzheimer's disease.

The study authors believe it was the B vitamins' effect on levels of homocysteine that helped slow the rate of brain shrinkage.

The study author, Professor David Smith, said the results were more significant than he had expected.

"It's a bigger effect than anyone could have predicted," he said, "and it's telling us something biological.

"These vitamins are doing something to the brain structure - they're protecting it, and that's very important because we need to protect the brain to prevent Alzheimer's."

He said more research was now needed to see whether high doses of B vitamins actually prevented the development of Alzheimer's in people with mild cognitive impairment.

The Alzheimer's Research Trust, which co-funded the study, also called for further investigation.

"These are very important results, with B vitamins now showing a prospect of protecting some people from Alzheimer's in old age," said chief executive Rebecca Wood.

"The strong findings must inspire an expanded trial to follow people expected to develop Alzheimer's."

B vitamins are found naturally in many foods, including meat, fish, eggs and green vegetables.

Experts are warning people not to start taking very high levels of vitamin supplements without medical advice.

Chris Kennard, chair of the Medical Research Council's Neurosciences and Mental Health Board, said: "We must be cautious when recommending supplements like vitamin B as there are separate health risks if taken in too high doses. "Further research is required before we can recommend the supplement as a treatment for neurodegenerative diseases, such as Alzheimer's."

The UK's Food Standards Agency says taking more than 200 milligrams a day of vitamin B6 can lead to a loss of feeling in the arms and legs, but these symptoms are reversible once someone stops taking the supplements.

It adds that taking 2mg or less of vitamin B12 supplements a day is unlikely to cause harm, but that there is not enough evidence to know what the effects of taking more than that would be.

Taking too much folic acid - over 1mg a day - can mask signs of vitamin B12 deficiency. An early symptom of B12 deficiency is anaemia, but taking large amounts of folic acid treats the anaemia without treating the B12 deficiency.

### **Ancient Greeks spotted Halley's comet**

\* 09 September 2010 by Jo Marchant

A CELESTIAL event in the 5th century BC could be the earliest documented sighting of Halley's comet - and it marked a turning point in the history of astronomy.

According to ancient authors, from Aristotle onwards, a meteorite the size of a "wagonload" crashed into northern Greece sometime between 466 and 468 BC. The impact shocked the local population and the rock became a tourist attraction for 500 years.

The accounts describe a comet in the sky when the meteorite fell. This has received little attention, but the timing corresponds to an expected pass of Halley's comet, which is visible from Earth every 75 years or so.

Philosopher Daniel Graham and astronomer Eric Hintz of Brigham Young University in Provo, Utah, modelled the path that Halley's comet would have taken, and compared this with ancient descriptions of the comet (Journal of Cosmology, vol 9, p 3030). For example, the comet was said to be visible for 75 days, accompanied by winds and shooting stars, and in the western sky when the meteorite fell.

The researchers show that Halley's comet would have been visible for a maximum of 82 days between 4 June and 25 August 466 BC. From 18 July onwards, a time of year characterised in this region by strong winds, it was in the western sky. At around this time, the Earth was moving under the comet's tail, so its debris field would have made shooting stars.

None of this proves the comet's identity, but Graham says such major comet sightings are rare, so Halley must be a "strong contender". Previously, the earliest known sighting of Halley was made by Chinese

astronomers in 240 BC. If Graham and Hintz are correct, the Greeks saw it three orbits and more than two centuries earlier.

The researchers' analysis reveals this moment to be a crucial turning point in the history of astronomy. Plutarch wrote in the 1st century AD that a young astronomer called Anaxagoras predicted the meteorite's fall to Earth, which has puzzled historians because such events are essentially random occurrences.

After studying what was said about Anaxagoras, Graham concludes that he should be recognised as "the star of early Greek astronomy". Rather than predicting a particular meteorite, he reckons Anaxagoras made a general statement that rocks might fall from the sky.

At this time, says Graham, everyone thought that celestial bodies such as the moon and planets were fiery, lighter-than-air objects. But after observing a solar eclipse in 478 BC, Anaxagoras concluded that they were heavy, rocky lumps, held aloft by a centrifugal force. This implied that solar eclipses occurred when the moon blocked the light from the sun. It also meant that if knocked from position, such a rock might crash to Earth.

"When the meteorite fell, no one could deny it," says Graham. "The headline was 'Anaxagoras was right'."

Did Halley's comet play a role? It is always possible that the comet might have nudged a near-Earth asteroid from its course and sent it hurtling towards northern Greece. From that point on, the idea of rocks in the sky was accepted, and the Greeks had a new understanding of the cosmos.

### **Prostate cancer screening backed for 'at risk' men**

#### ***Prostate cancer cells A number of genetic factors can put men at higher risk of prostate cancer***

Screening men with a family history of breast and ovarian cancer can lead to early diagnosis of prostate cancer, a UK study says. More cancers were found in carriers of BRCA gene mutations, and they were twice as likely to require treatment. Scientists from the Institute of Cancer Research and the Royal Marsden Hospital screened 300 men aged between 40 and 69. The study aims to screen a total of 1,700 men over five years.

Preliminary results from the first group of men are published in the British Journal of Urology International.

This is the first large international prostate cancer screening study targeted at men with a known genetic predisposition to the disease. Called IMPACT (Identification of Men with a genetic predisposition to ProstAte Cancer), the study is gathering data in 32 centres in 11 different countries.

#### **Gene mutations**

Scientists already know that a number of genetic factors can put men at a higher risk of prostate cancer.

These include mutations in the genes BRCA1 and BRCA2. A BRCA2 mutation can increase risk by up to seven-fold, while a BRCA1 mutation is thought to double risk in men under 65 years old, says the study.

In the group studied, 205 men had confirmed gene mutations and 95 tested negative for BRCA1 and BRCA2 mutations. All were given a PSA test, a blood test for prostate specific antigen.

Twenty-four men had an elevated PSA result and they were then offered a prostate biopsy. The biopsies revealed that nine mutation carriers had prostate cancer, compared to two in the non-carrying control group.

PSA screening has been contentious in the past because of concerns about over-diagnosis. How effective it was at reducing mortality also remained unclear.

But scientists in this study found that the number of cancers detected relative to the number of biopsies conducted was 48%, compared to 24% in the general population.

#### **Targeted screening**

Professor Ros Eeles from the ICR and Royal Marsden, who led the study, said: "Although these are early results, it appears that PSA screening is reasonably accurate at predicting potentially aggressive prostate cancer among men at higher risk of the disease due to a genetic predisposition."

"This study provides support for continued screening in men with genetic mutations," she said.

Figures show that more than 36,000 men are diagnosed with prostate cancer each year in the UK.

Professor Eeles says targeted screening of men at high risk of prostate cancer, "could help us find more cancers, the sort of the cancers you can treat." But she stresses that the BRCA gene mutation is not common in men. Only men with a strong family history of breast and ovarian cancer should ask for a genetic test. While the test is not routinely offered in the UK, men over 45 can request one.

John Neate, chief executive of The Prostate Cancer Charity, said: "These results are early, initial results from a study which will take many years to complete.

"We await with interest the full results of this study and we urge the UK National Screening Committee, the body responsible for assessing the validity of the PSA blood test as a screening tool, to consider the research findings once the study is complete.

"In the meantime, it is imperative that we move quickly to a position of 'universal informed choice' where all men - particularly those over 50 or at increased risk of the disease - have the opportunity to make an informed decision about whether to have the PSA test," he said.



## 'Sponge checks' for oesophageal cancer risk

**Swallowing a sponge on a piece of string could help prevent a deadly form of cancer, UK experts claim.**

Medical Research Council scientists have created the "cytosponge" which collects cells from the stomach. These cells can be checked for a pre-cancerous condition called Barrett's oesophagus which can affect people with a long history of heartburn.

One in 10 people with the condition will go on to develop oesophageal, or food pipe cancer. Around 375,000 people develop Barrett's oesophagus in the UK each year. One in 10 of them will go on to develop oesophageal cancer. Over 80% of those diagnosed with the cancer die within five years.

Surgical treatments for Barrett's oesophagus have, in the past, been invasive and relatively risky. But procedures can now be carried out using keyhole surgery.

The ideal testing method uses an endoscope, a long thin tube with a camera on the end. But it is expensive and equipment is limited. The MRC's study is reported in the British Medical Journal.

The team say the cytosponge could be used in primary care as an inexpensive and easily-administered test.

### **Bleak prognosis**

When the sponge is swallowed, it expands to a three-centimetre mesh in the stomach. It is pulled out after five minutes and the cells it collects can then be analysed in the lab. The researchers, from the MRC's Cancer Cell Unit in Cambridge, tested the device on 500 patients aged between 50 and 70, who also had endoscopies to check the results. The sponge detected over 90% of cases of Barrett's oesophagus.

Dr Rebecca Fitzgerald, who led the research, said: "The UK has the highest level of this form of oesophageal cancer in Europe, and cases in the western world have risen rapidly over the past 20 years.

"As oesophageal cancer carries such a bleak prognosis for patients, it has become more and more obvious that a safe, minimally invasive and easily administered method of diagnosis for Barrett's oesophagus is urgently needed. "We are delighted that this trial has shown that patients find this method acceptable and it is a practical screening option." The researchers will now carry out more studies into the sponge's effectiveness.

Writing in the BMJ Peter Bampton, associate professor in gastroenterology at Flinders University in Australia, said: "Although larger studies are needed to validate these and other markers, future screening and surveillance for Barrett's oesophagus might use a two-step approach, with endoscopy being reserved to confirm the diagnosis."

## **Rare victory in fight against melanoma**

**Genetically tailored approach could slow disease progress.**

**Heidi Ledford**

Patients with advanced melanoma rarely live for more than a year after their diagnosis — a prognosis that has not improved for more than 30 years. But clinical-trial results<sup>1</sup> now suggest that a genetically targeted approach could slow the disease's steady march through the body, and separate research<sup>2</sup> reveals why the latest drug being tested may succeed where others failed.

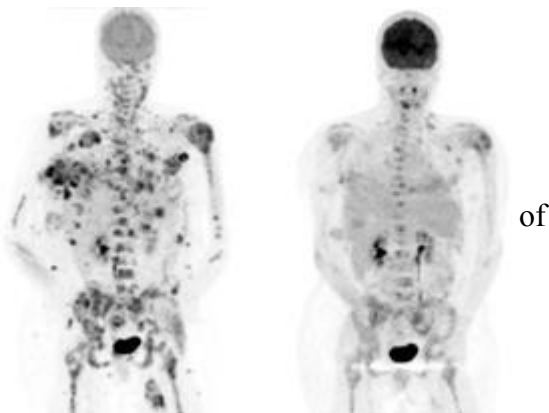
The drug could be the first melanoma treatment to join an elite but expanding list of cancer therapies tailored to a patient's genetic make-up (see 'Seek and destroy'). "It's spectacular," says Richard Marais, a molecular biologist at the Institute of Cancer Research in London, who was not affiliated with either study. "There's been a paradigm shift in how you would treat melanoma."

**Melanoma tumours shrank after patients took PLX4032 for 2 weeks. Melanoma tumours shrank after patients took PLX4032 for 2 weeks. REF. 2**

In 2002, Marais and his colleagues reported<sup>3</sup> that more than 60% patients with melanoma — cancer of the melanin-producing cells typically found in skin — carry mutations in a gene that encodes a protein called B-RAF. The mutations trigger a signalling pathway that accelerates cancerous cell growth.

Drug companies pricked up their ears at the discovery. One of them, a small biotechnology company in Berkeley, California, called Plexxikon, started fishing for compounds that would selectively block mutated B-RAF by filling the unique pocket that the genetic mutation etches into the protein's three-dimensional structure.

At first, the approach was greeted with scepticism, says Plexxikon's chief executive Peter Hirth. Decades of failure had taught drug companies to shy away from testing drugs against advanced melanoma. "People don't want to do clinical trials in melanoma," agrees Marais. "It's sort of the death knell for all cancer therapies."



Early tests of Plexxikon's drug, called PLX4032, were disappointing. Some patients in the trial were taking dozens of pills a day, to no effect. "But we just couldn't give the patients any more pills," says Paul Chapman, a cancer researcher at the Memorial Sloan-Kettering Cancer Center in New York and a co-author on the latest clinical trial<sup>1</sup>. "We were starting to think we were going to obstruct their gut with all the cellulose from the capsules." So Plexxikon, together with its partner, Swiss drug maker Roche, developed a new formulation of the drug that was more easily absorbed by the body.

That reformulation proved crucial. On 26 August, researchers published the first findings from a small clinical trial of the reformulated drug. In one arm of the study<sup>1</sup>, tumours shrank by at least 30% in 24 out of 32 patients with B-RAF mutations, and disappeared entirely in two other patients.

This week in Nature<sup>2</sup>, the Plexxikon team reveals why the high doses were necessary: analysis of tumour samples from patients who received different amounts of the drug showed that PLX4032 was effective only at concentrations sufficient to block about 80% of signalling through the B-RAF pathway. This roughly matches early clinical-trial results of a similar drug being developed by London-based GlaxoSmithKline (GSK), says Jeffrey Legos, the company's medicines development leader.

The Plexxikon team also found that PLX4032 was remarkably specific for the mutated form of B-RAF, binding relatively poorly, if at all, to more than 200 other proteins, including unmutated B-RAF. That selectivity, says Hirth, probably explains why patients were able to take PLX4032 at such high doses without severe side effects.

Despite the promising results, PLX4032 has been tested in only a small number of patients and it is too early to declare the drug a success, cautions Chapman. The next stage is a larger trial in 700 patients, which began in January.

And although PLX4032 has clear short-term effects on tumour growth, researchers don't yet know whether the drug will allow patients to live significantly longer. Melanoma tumours quickly become resistant to PLX4032, and researchers estimate that tumour growth typically resurges about seven months after the start of therapy. "These cancer cells are smart," says Legos. "You shut down one specific pathway, and they will find a different way to survive." Nevertheless, Legos notes that, given the short survival of patients with advanced melanoma, it seems likely that drugs such as PLX4032 will have some effect on lifespan.

To overcome resistance, PLX4032 will be tested in combination with other drugs. In addition to the larger trial of PLX4032 alone, Plexxikon is planning a trial that will combine PLX4032 with an experimental drug that blocks MEK, another protein involved in the cell-growth-promoting pathway. Meanwhile, GSK is recruiting patients for a clinical trial combining two of its own experimental drugs, which respectively block mutated B-RAF and MEK.

For now, the promising results from PLX4032 highlight the power of targeting specific genetic mutations in tumours, says Yardena Samuels, a cancer geneticist at the National Human Genome Research Institute in Bethesda, Maryland. "It's a very important development, not just for melanoma, but for the entire cancer field."

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### A smart use for wisdom teeth: Making stem cells

For most people, wisdom teeth are not much more than an annoyance that eventually needs to be removed. However, a new study appearing in the September 17 *Journal of Biological Chemistry* shows that wisdom teeth contain a valuable reservoir of tissue for the creation of stem cells; thus, everyone might be carrying around his or her own personal stem-cell repository should he or she ever need some.

Groundbreaking research back in 2006 revealed that inducing the activity of four genes in adult cells could "reprogram" them back into a stem-cell-like state; biologically, these induced-pluripotent stem cells are virtually identical to embryonic stem cells, opening up a new potential avenue for stem-cell therapy whereby patients could be treated with their own stem cells.

However, despite their promise, making iPS cells is not easy; the reprogramming efficiencies are very low and vary among the cells that can be used for iPS generation and thus require good amount of "starter" cells - which might involve difficult extraction from body tissue (unfortunately skin cells, the easiest to acquire, show very low reprogramming efficiency).

Now, a team of scientists at Japan's National Institute of Advanced Industrial Science and Technology may have found an ideal source: third molars, commonly known as wisdom teeth.

The soft pulp inside of teeth contains a population of cells known as mesenchymal stromal cells that are similar to cells found in bone marrow, a common stem-cell source. However, unlike bone marrow, tooth pulp is more easily obtained, especially in wisdom teeth, which most individuals have removed anyway.

The researchers, led by Hajime Ohgushi, collected tooth samples from three donors and managed to generate a series of iPS cell lines following the similar procedure of activating three key genes (however, in another beneficial change they did not have activate the c-MYC gene which might lead the cells to become cancerous).

The different cell lines displayed varying degrees of robustness but in some cases proliferated quite well, up to 100 times more efficiently than typical skin-cell-derived iPS cells. The molar-derived cells also could differentiate into many other cell types including beating cardiomyocytes (see a movie below), as expected.

MSCs taken from wisdom teeth and reprogrammed into stem cells can become numerous other cell types, like these beating cardiomyocytes. Credit: Hajime Ohgushi

The presence of a supply of MSCs in wisdom teeth could have meaningful therapeutic ramifications. As noted by the researchers and others, wisdom tooth extraction is a common medical procedure in developed nations and, thus, creates a perfect opportunity to remove biological material in a sterilized setting; the teeth subsequently can be frozen and stored for many years until needed. In the meantime, that also provides time for researchers to better understand the details of iPS creation to further increase the efficiency for clinical use.

*More information: Article Link: <http://www.jbc.org> ... 285/38/29270*

*Provided by American Society for Biochemistry and Molecular Biology*

## **The 10 Deadliest Cancers and Why There's No Cure**

**By Amanda Chan, MyHealthNewsDaily Staff Writer**

The dread and fear that can come with a cancer diagnosis have their roots in its killer nature: It's the No. 2 cause of death in Americans, second only to heart disease, according to the Centers for Disease Control and Prevention. Even when diagnosed early and attacked with the latest treatments, it still has the power to kill.

To help raise money to find cures and treatments for cancer patients, the "Stand Up to Cancer" telethon will air on ABC, NBC and CBS and other networks and cable stations starting at 8 p.m. ET tonight. The telethon will feature a host of celebrity guests, including George Clooney, Denzel Washington, Renee Zellweger and Will Smith.

"Stand Up To Cancer' represents collaborative efforts" to provide funding for cancer research, Dr. Len Lichtenfeld, deputy chief medical officer of the American Cancer Society, told MyHealthNewsDaily.

"We would not be where we are if basic and clinical science wasn't funded," Lichtenfeld said. "Basic science teaches us about mechanisms, about how drugs may be effective, and we take that info and put it into a clinic to find out whether or not those new ideas work in cancer treatment."

While there are many successful treatments today that didn't exist just a couple decades ago, a wholesale "cure for cancer" remains elusive for many reasons. There are more than 100 types of cancer, characterized by abnormal cell growth. There are many different causes, ranging from radiation to chemicals to viruses; an individual has varying degrees of control over exposure to cancer-causing agents.

Cancer cells, and how they grow, remain unpredictable and in some cases mysterious. Even after seemingly effective treatments, crafty cancer cells are able to hide out in some patients and resurface.

About \$200 billion has been spent on cancer research since the early 1970s, and the five-year survival rate for all people diagnosed with cancer in the U.S. has risen from about 50 percent in the 1970s to 65 percent today.

Here's a look at the 10 cancers that killed the most people in the United States between 2003 and 2007, the most recent data available, according to the National Cancer Institute (NCI).

### **1. Lung and bronchial cancer: 792,495 lives**

Lung and bronchial cancer is the top killer cancer in the United States. Smoking and use of tobacco products are the major causes of it, and it strikes most often between the ages of 55 and 65, according to the NCI. There are two major types: non-small cell lung cancer, which is the most common, and small cell lung cancer, which spreads more quickly. More than 157,000 people are expected to die of lung and bronchial cancer in 2010.

### **2. Colon and rectal cancer: 268,783 lives**

Colon cancer grows in the tissues of the colon, whereas rectal cancer grows in the last few inches of the large intestine near the anus, according to the National Cancer Institute. Most cases begin as clumps of small, benign cells called polyps that over time become cancerous. Screening is recommended to find the polyps before they become cancerous, according to the Mayo Clinic. Colorectal cancer is expected to kill more than 51,000 people in 2010.

### **3. Breast cancer: 206,983 lives**

Breast cancer is the second most common cancer in women in the United States, after skin cancer, according to the Mayo Clinic. It can also occur in men – there were nearly 2,000 male cases between 2003 and 2008. The cancer usually forms in the ducts that carry milk to the nipple or the glands that produce the milk in women. Nearly 40,000 people are expected to die from breast cancer in 2010, according to the NCI.

**4. Pancreatic cancer: 162,878 lives**

Pancreatic cancer begins in the tissues of the pancreas, which aids digestion and metabolism regulation. Detection and early intervention are difficult because it often progresses stealthily and rapidly, according to the Mayo Clinic. Pancreatic cancer is expected to claim nearly 37,000 lives in 2010, according to the NCI.

**5. Prostate cancer: 144,926 lives**

This cancer is the second-leading cause of cancer deaths in men, after lung and bronchial cancer, according to the NCI. Prostate cancer usually starts to grow slowly in the prostate gland, which produces the seminal fluid to transport sperm. Some types remain confined to the gland, and are easier to treat, but others are more aggressive and spread quickly, according to the Mayo Clinic. Prostate cancer is expected to kill about 32,000 men in 2010, according to the NCI.

**6. Leukemia: 108,740 lives**

There are many types of leukemia, but all affect the blood-forming tissues of the body, such as the bone marrow and the lymphatic system, and result in an overproduction of abnormal white blood cells, according to the NCI. Leukemia types are classified by how fast they progress and which cells they affect; a type called acute myelogenous leukemia killed the most people – 41,714 – between 2003 and 2007. Nearly 22,000 people are expected to die from leukemia in 2010.

**7. Non-Hodgkin lymphoma: 104,407 lives**

This cancer affects the lymphocytes, a type of white blood cell, and is characterized by larger lymph nodes, fever and weight loss. There are several types of non-Hodgkin lymphoma, and they are categorized by whether the cancer is fast- or slow-growing and which type of lymphocytes are affected, according to the NCI. Non-Hodgkin lymphoma is deadlier than Hodgkin lymphoma, and is expected to kill more than 20,000 people in 2010.

**8. Liver and intrahepatic bile duct cancer: 79,773 lives**

Liver cancer is one of the most common forms of cancer around the world, but is uncommon in the United States, according to the Mayo Clinic. However, its rates in America are rising. Most liver cancer that occurs in the U.S. begins elsewhere and then spreads to the liver. A closely related cancer is intrahepatic bile duct cancer, which occurs in the duct that carries bile from the liver to the small intestine. Nearly 19,000 Americans are expected to die from liver and intrahepatic bile duct cancer in 2010, according to the NCI.

**9. Ovarian cancer: 73,638 lives**

Ovarian cancer was the No. 4 cause of cancer death in women between 2003 and 2007, according to the NCI. The median age of women diagnosed with it is 63. The cancer is easier to treat but harder to detect in its early stages, but recent research has brought light to early symptoms that may aid in diagnosis, according to the Mayo Clinic. Those symptoms include abdominal discomfort, urgency to urinate and pelvic pain. Nearly 14,000 women are expected to die of ovarian cancer in 2010, according to the NCI.

**10. Esophageal cancer: 66,659 lives**

This cancer starts in the cells that line the esophagus (the tube that carries food from the throat to the stomach) and usually occurs in the lower part of the esophagus, according to the Mayo Clinic. More men than women died from esophageal cancer between 2003 and 2007, according to the NCI. It is expected to kill 14,500 people in 2010.

### **Study finds that sorghum bran has more antioxidants than blueberries, pomegranates**

September 10, 2010 by Kirk McAlpin

A new University of Georgia study has found that select varieties of sorghum bran have greater antioxidant and anti-inflammatory properties than well-known foods such as blueberries and pomegranates.

Researchers measured polyphenolic compounds, which naturally occur in plants to help fight against pests and disease, and found that the black and sumac varieties of sorghum have significant levels of antioxidants. Many fruits also contain these compounds, they said, though sorghum bran may prove to be the richest and cheapest source.

“Since most human chronic disease states are associated with chronic inflammation and high oxidative stress, a food ingredient such as sorghum bran could potentially make certain processed foods better for a healthy diet,” said study co-author Diane Hartle, director of the UGA Nutraceutical Research Laboratory and an associate professor in the College of Pharmacy.

Hartle and her colleagues, whose results appear in the current issue of the Journal of Medicinal Food, measured the degree to which extracts from four different varieties of sorghum reduced inflammation in mice. They found that black and sumac varieties showed significantly higher levels of polyphenolic content and antioxidant levels than the two low-tannin varieties tested, which did not reduce inflammation.

The authors found that levels of polyphenolic compounds in the high-tannin sorghum varieties ranged from 23 to 62 mg of polyphenols per gram. For comparison, blueberries contain approximately 5 mg of polyphenolics per gram, while pomegranate juice contains 2 to 3.5 mg per gram.

The U.S. is the largest producer of sorghum in the world. Most of the sorghum grown, however, is a low-tannin variety that is fed to cattle and poultry or used to manufacture ethanol to fuel cars. "High-tannin sorghums can be of greater economy to manufacturers because of the current cost of berry and fruit sources of similar plant-based chemicals," said study co-author Phillip Greenspan, associate professor in the UGA College of Pharmacy.

High-tannin sorghum bran products have not been available in supermarket foods until recently. The researchers said they hope to generate interest in sorghum bran or its extract as an additive to food and beverages. Sorghum bran extract could be added to a variety of foods and beverages as a liquid concentrate or dried powder. The Great Plains area of the U.S. is the largest worldwide producer of sorghum, and the researchers said that the combination of its low price and high antioxidant and anti-inflammatory properties will make it widely useful as an inexpensive and nutritional food additive.

The researchers have already experimented with adding the extract to apple juice to make it an affordable alternative to pomegranate juice and other antioxidant-rich products. "We're hoping that some company decides to extract this bran and pull these chemicals out and put the extract into a beverage that can help you fight disease rather than promote disease," Hartle said.

Study co-author James Hargrove, associate professor in the UGA College of Family and Consumer Sciences, added that high-tannin sorghum has more antioxidant phytochemicals than other brans such as rice, wheat and oats, whose phenolic content and antioxidant values are low. He and Hartle said that the use of sorghum can become a way to reintroduce a quality food to many products that now use bleached, refined flour.

"Sorghum bran not only provides the fiber but gives you a real medicinal punch at the same time because it delivers a lot of other chemicals that a berry would give you," Hartle said.

*Provided by University of Georgia*

## **2000-year-old pills found in Greek shipwreck**

Updated 10:57 10 September 2010 by Shanta Barley

In 130 BC, a ship fashioned from the wood of walnut trees and bulging with medicines and Syrian glassware sank off the coast of Tuscany, Italy. Archaeologists found its precious load 20 years ago and now, for the first time, archaeobotanists have been able to examine and analyse pills that were prepared by the physicians of ancient Greece. DNA analyses show that each millennia-old tablet is a mixture of more than 10 different plant extracts, from hibiscus to celery.

"For the first time, we have physical evidence of what we have in writing from the ancient Greek physicians Dioscorides and Galen," says Alain Touwaide of the Smithsonian Institution's National Museum of Natural History in Washington DC.

The box of pills was discovered on the wreck in 1989, with much of the medicine still completely dry, according to Robert Fleischer of the Smithsonian's National Zoological Park, also in Washington DC.

### **Herbal remedies**

Fleischer analysed DNA fragments in two of the pills and compared the sequences to the GenBank genetic database maintained by the US National Institutes of Health. He was able to identify carrot, radish, celery, wild onion, oak, cabbage, alfalfa and yarrow. He also found hibiscus extract, probably imported from east Asia or the lands of present-day India or Ethiopia.

"Most of these plants are known to have been used by the ancients to treat sick people," says Fleischer. Yarrow staunches the flow of blood from wounds, and Pedanius Dioscorides, a physician and pharmacologist in Rome in the first century AD, described the carrot as a panacea for a number of problems. "They say that reptiles do not harm people who have taken it in advance; it also aids conception," he wrote around 60 AD.

The concoctions have also thrown archaeobotanists a few curve balls. Preliminary analyses of the ancient pills suggest they contain sunflower, a plant that is not thought to have existed in the Old World before Europeans discovered the Americas in the 1400s. If the finding is confirmed, botanists may need to revise the traditional history of the plant and its diffusion, says Touwaide – but it's impossible for now to be sure that the sunflower in the pills isn't simply from recent contamination.

### **Quacks no more**

Drugs described by Dioscorides and another Greek physician known as Galen of Pergamon have often been dismissed as ineffectual quackery. "Scholars and scientists have often dismissed the literature on such medicines, and expressed doubt about their possible efficacy, which they attributed only to the presence of opium," says Touwaide. He hopes to resolve this debate by exploring whether the plant extracts in the pills are now known to treat illnesses effectively.

He also hopes to discover therian – a medicine described by Galen in the second century AD that contains more than 80 different plant extracts – and document the exact measurements ancient doctors used to manufacture the pills. "Who knows, these ancient medicines could open new paths for pharmacological research," says Touwaide.

The team presented their findings yesterday at the Fourth International Symposium on Biomolecular Archaeology in Copenhagen, Denmark.

*When this article was first posted, "theriac" was misspelled, and we assigned Galen to the wrong century.*

### **It's a Bird, It's a Plane, It's a...a...Fish!**

**Analysis by Zahra Hirji**

Fish aren't birds. Seems like a simple enough argument; one lives in the water, the other flies around and lives pretty much wherever it likes.

Then there are flying fish. Like flying squirrels and scuba divers, these animals appear profoundly confused about which element they belong in. They blur the lines about what it means to be a "fish". The thing is, they're good at it -- flying fish can remain aloft for up to 45 seconds and travel a quarter of a mile above the water.

How do they do it? Two engineers at Seoul National University in Korea, Haecheon Choi and Hyungmin Park, have just found out.

Previous studies determined that these fish initially swim extremely fast and gain momentum before bursting forth from the water. Once airborne, they glide with their wing-like fins spread out wide, looking very much like a bird or insect. When they need an additional speed boost part-way through their flight, they beat their tails against the water in a motion called taxiing.

But, until now, researchers had no idea just what efficient fliers they were.

There are about 40 known species of flying fish. They are all equipped with two large pectoral fins that serve as "wings" in the air. Some also come with additional back or pelvic fins and are called "four-wingers".

Particularly interested in uncovering the mechanisms of four-winger flight, Choi and Park analyzed dark-edged-wing flying fish (*Cypselurus hiraii*) from the East Sea of Korea. The fish were stuffed in a way that maintained their body size and wing flexibility, sensors were attached to different points on their bodies and they were mounted in a wind tunnel.

Researchers tested the lift-to-drag ratio of the fish -- that is, the measure of horizontal distance covered relative to change in height during a flight. They observed the animals' aerodynamics when tilted to different angles and when lifted above both a solid and liquid surface.

In a recent article in the *Journal of Experimental Biology*, Choi and Park reported that when fish fly close and parallel to the sea surface they reduce their drag, increasing their lift-to-drag ratio, and thus maximizing flight efficiency. In fact, according to the researchers their gliding ability "is comparable to those of bird wings such as the hawk, petrel, and wood duck."

Though Choi and Park have solved the mystery as to how these fish fly, scientists are still unsure why they fly. The leading theory is that it enables them to avoid predators. Another idea is that the combination of flying and swimming is a more efficient mode of transportation that saves the fish energy.

### **IV Drips Can Be Left in Place, Study Shows**

Small intravenous devices (IVDs) commonly used in the hand or arm do not need to be moved routinely every 3 days. A randomized controlled trial comparing regular relocation with relocation on clinical indication, published in the open access journal *BMC Medicine*, found that rates of complications were the same for both regimens.

Claire Rickard, from Griffith University, Australia, worked with a team of researchers to carry out the study with 362 patients at Launceston General Hospital, Tasmania. She said, "Recommended timelines for routine resite have been extended over the past three decades from 24 to 72 hours. Currently, 72- to 96-hour resite is recommended. Even with these extended durations, such policies still cause increased workload in hospitals, where the task of removing and replacing well-functioning IVDs generally falls to busy nursing and junior medical staff. Our results indicate that the average duration of IV therapy is 5-6 days and that many catheters can remain complication-free for this period, or even longer."

The researchers found that complication rates between the groups were not significantly different. The policy of resite on clinical indication led to one in two patients needing only a single cannula to receive treatment,

whereas a 3-day change policy resulted in one in five patients having this scenario, with the rest requiring multiple cannulations and therefore additional pain and inconvenience.

According to Rickard, "The routine resite of peripheral IVDs increases patient discomfort and healthcare costs, but does not reduce IVD complications as has traditionally been thought."

**Story Source:** The above story is reprinted (with editorial adaptations by ScienceDaily staff) from materials provided by BioMed Central Limited, via AlphaGalileo.

**Journal Reference:** 1. Claire M Rickard, Damhnat McCann, Jane Munnings, Matthew R McGrail. Routine resite of peripheral intravenous devices every 3 days did not reduce complications compared with clinically indicated resite: a randomised controlled trial. *BMC Medicine*, 2010; 8:53 DOI: 10.1186/1741-7015-8-53

## Emerging technologies may fuel revolutionary horizontal space launcher

(PhysOrg.com) -- As NASA studies possibilities for the next launcher to the stars, a team of engineers from Kennedy Space Center and several other field centers are looking for a system that turns a host of existing cutting-edge technologies into the next giant leap spaceward.

An early proposal has emerged that calls for a wedge-shaped aircraft with scramjets to be launched horizontally on an electrified track or gas-powered sled. The aircraft would fly up to Mach 10, using the scramjets and wings to lift it to the upper reaches of the atmosphere where a small payload canister or capsule similar to a rocket's second stage would fire off the back of the aircraft and into orbit. The aircraft would come back and land on a runway by the launch site.



***This artist's concept shows a potential design for a rail-launched aircraft and spacecraft that could revolutionize the launch business. Early designs envision a 2-mile-long track at Kennedy Space Center shooting a Mach 10-capable carrier aircraft to the upper reaches of the atmosphere. then a second stage booster would fire to lift a satellite or spacecraft into orbit. Credit: NASA/Artist concept***

Engineers also contend the system, with its advanced technologies, will benefit the nation's high-tech industry by perfecting technologies that would make more efficient commuter rail systems, better batteries for cars and trucks, and numerous other spinoffs.

It might read as the latest in a series of science fiction articles, but NASA's Stan Starr, branch chief of the Applied Physics Laboratory at Kennedy, points out that nothing in the design calls for brand-new technology to be developed. However, the system counts on a number of existing technologies to be pushed forward.

"All of these are technology components that have already been developed or studied," Starr said. "We're just proposing to mature these technologies to a useful level, well past the level they've already been taken."

For example, electric tracks catapult rollercoaster riders daily at theme parks. But those tracks call for speeds of a relatively modest 60 mph -- enough to thrill riders, but not nearly fast enough to launch something into space. The launcher would need to reach at least 10 times that speed over the course of two miles in Starr's proposal.

The good news is that NASA and universities already have done significant research in the field, including small-scale tracks at NASA's Marshall Space Flight Center in Huntsville, Ala., and at Kennedy. The Navy also has designed a similar catapult system for its aircraft carriers.

As far as the aircraft that would launch on the rail, there already are real-world tests for designers to draw on. The X-43A, or Hyper-X program, and X-51 have shown that scramjets will work and can achieve remarkable speeds.

The group sees NASA's field centers taking on their traditional roles to develop the Advanced Space Launch System. For instance, Langley Research Center in Virginia, Glenn Research Center in Ohio and Ames Research Center in California would work on different elements of the hypersonic aircraft. Dryden Research Center in California, Goddard Space Flight Center in Maryland and Marshall would join Kennedy in developing the launch rail network. Kennedy also would build a launch test bed, potentially in a two-mile long area parallel to the crawlerway leading to Launch Pad 39A.

Because the system calls for a large role in aeronautic advancement along with rocketry, Starr said, "essentially you bring together parts of NASA that aren't usually brought together. I still see Kennedy's core role as a launch and landing facility."

The Advanced Space Launch System is not meant to replace the space shuttle or other program in the near future, but could be adapted to carry astronauts after unmanned missions rack up successes, Starr said.

The studies and development program could also be used as a basis for a commercial launch program if a company decides to take advantage of the basic research NASA performs along the way. Starr said NASA's fundamental research has long spurred aerospace industry advancement, a trend that the advanced space launch system could continue.

For now, the team proposed a 10-year plan that would start with launching a drone like those the Air Force uses. More advanced models would follow until they are ready to build one that can launch a small satellite into orbit.

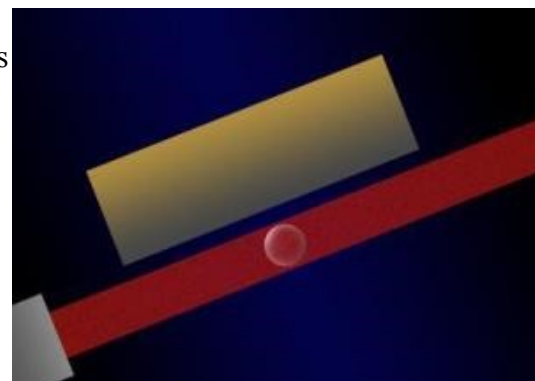
A rail launcher study using gas propulsion already is under way, but the team is applying for funding under several areas, including NASA's push for technology innovation, but the engineers know it may not come to pass. The effort is worth it, however, since there is a chance at revolutionizing launches.

"It's not very often you get to work on a major technology revolution," Starr said. *Provided by JPL/NASA*

### **Glasperlenspiel: Scientists Propose New Test for Gravity**

A new experiment proposed by physicists at the National Institute of Standards and Technology (NIST) may allow researchers to test the effects of gravity with unprecedented precision at very short distances -- a scale at which exotic new details of gravity's behavior may be detectable.

Of the four fundamental forces that govern interactions in the universe, gravity may be the most familiar, but ironically it is the least understood by physicists. While gravity's influence is well-documented on bodies separated by astronomical or human-scale distances, it has been largely untested at very close scales -- on the order of a few millionths of a meter -- where electromagnetic forces often dominate. This lack of data has sparked years of scientific debate.



*A beam of laser light (red) should be able to cause a glass bead of approximately 300 nanometers in diameter to levitate, and the floating bead would be exquisitely sensitive to the effects of gravity. Moving a large heavy object (gold) to within a few nanometers of the bead could allow the team to test the effects of gravity at very short distances.*  
(Credit: K. Talbott/NIST)

"There are lots of competing theories about whether gravity behaves differently at such close range," says NIST physicist Andrew Geraci, "But it's quite difficult to bring two objects that close together and still measure their motion relative to each other very precisely."

In an attempt to sidestep the problem, Geraci and his co-authors have envisioned an experiment that would suspend a small glass bead in a laser beam "bottle," allowing it to move back and forth within the bottle. Because there would be very little friction, the motion of the bead would be exquisitely sensitive to the forces around it, including the gravity of a heavy object placed nearby.

According to the research team, the proposed experiment would permit the testing of gravity's effects on particles separated by 1/1,000 the diameter of a human hair, which could ultimately allow Newton's law to be tested with a sensitivity 100,000 times better than existing experiments.

Actually realizing the scheme -- detailed in a new paper in *Physical Review Letters* -- could take a few years, co-author Scott Papp says, in part because of trouble with friction, the old nemesis of short-distance gravity research. Previous experiments have placed a small object (like this experiment's glass bead) onto a spring or short stick, which have created much more friction than laser suspension would introduce, but the NIST team's idea comes with its own issues.

"Everything creates some sort of friction," Geraci says. "We have to make the laser beams really quiet, for one thing, and then also eliminate all the background gas in the chamber. And there will undoubtedly be other sources of friction we have not yet considered."

For now, Geraci says, the important thing is to get the idea in front of the scientific community.

"Progress in the scientific community comes not just from individual experiments, but from new ideas," he says. "The recognition that this system can lead to very precise force measurements could lead to other useful experiments and instruments."

**Story Source:** *The above story is reprinted (with editorial adaptations by ScienceDaily staff) from materials provided by National Institute of Standards and Technology (NIST).*

**Journal Reference:** 1. Andrew Geraci, Scott Papp, John Kitching. Short-Range Force Detection Using Optically Cooled Levitated Microspheres. *Physical Review Letters*, 2010; 105 (10): 101101 DOI: 10.1103/PhysRevLett.105.101101



## **Increasing Selenium Intake May Decrease Bladder Cancer Risk**

A common mineral may provide protection against bladder cancer.

According to results of a study published in the September issue of *Cancer Epidemiology, Biomarkers & Prevention*, a journal of the American Association for Cancer Research, selenium intake is associated with decreased risk of bladder cancer.

"The lower the levels of selenium, the higher the risk of developing bladder cancer," said lead researcher Núria Malats, M.D., Ph.D., leader of the Genetic and Molecular Epidemiology Group, Human Cancer Genetics Program, Spanish National Cancer Research Center.

Selenium is an essential micronutrient that is incorporated into about 25 proteins, called selenoproteins. Most of these selenoproteins are enzymes with antioxidant properties that prevent cellular damage caused by the by-products of oxygen metabolism, according to Malats.

The main dietary sources of this micronutrient are plant foods grown in selenium-rich soils, animals who graze on these soils and selenium-enriched products.

Using data from seven previously published studies, Malats and colleagues conducted a meta-analysis to evaluate selenium levels measured in serum and toenails and the risk of developing bladder cancer. The data included individuals mostly from the United States, but also from Belgium, Finland and the Netherlands.

The researchers noted a significant protective effect of selenium, mainly among women, which they believe may result from gender-specific differences in the mineral's accumulation and excretion in women.

"Although our results suggest a beneficial effect of high selenium intake for bladder cancer risk, more studies are needed to confirm these findings before an enforcement of high selenium intake is recommended," Malats said.

Cancer Epidemiology, Biomarkers & Prevention Editorial Board Member Elizabeth A. Platz, Sc.D., M.P.H., said, "these findings provide a valuable lead for what to do next to understand if there is a role for selenium supplementation in bladder cancer prevention."

The next research step is to address the dose-response relationship. Addressing this relationship is of public health importance for setting recommended daily intakes for selenium and for targeting subsets of the population for selenium supplementation, added Platz, who is a professor in the department of epidemiology at Johns Hopkins Bloomberg School of Public Health.

*The above story is reprinted (with editorial adaptations by ScienceDaily staff) from materials provided by American Association for Cancer Research.*