

## Abrupt Changes in Climates Past Put Models on Notice

By John D. Cox

***Some of the world's most powerful supercomputers are devoted to ingeniously devised model simulations intended to help us understand what our future climate will be like. So you'd think they would be pretty good at it.***

But people most familiar with how the climate system behaved in the past - before humans came along to alter the composition of its atmosphere - see patterns of natural change that are fundamentally different from what the biggest, most complex models project for the future.

Remarkably, the character of this "disconnect" between geological data of the past and computer simulations of the future is not at all what people who complain about climate science and climate scientists would have us believe.

"The models seem to be too stable," Paul Valdes, a climate modeler and "paleoclimate" specialist at the University of Bristol in the UK, argues in the new issue of the journal *Nature Geoscience*.

***IMAGE: Right to left, the temperature profile of air over Greenland during the past 100,000 years, taken from Greenland Ice Core Project II. National Research Council***

Judging from the evidence, Earth's climate is more sensitive than the computer models designed to simulate its behavior.

Thousands of years of climates past are punctuated by episodes of change that are rapid and radical - big, sudden shifts in temperature and precipitation. This inclination toward "abrupt climate change" - found in ice cores, ocean sediments and other geological data - surprised earth scientists as it was uncovered in the 1990s, and still it remains outside of much conventional thinking on the subject.

Valdes argues that the models used by the UN's Intergovernmental Panel on Climate Change in its most recent report (2007) "have not proved their ability to simulate abrupt change when a critical threshold is crossed."

Scientists calculate the likely accuracy of models to foretell the future by testing their ability to accurately recreate the past.

Valdes cites four examples of abrupt changes in the distant past which "could have direct bearing on climate predictions for the twenty-first century" that the current generation of big, complex climate models are unable to accurately recreate:

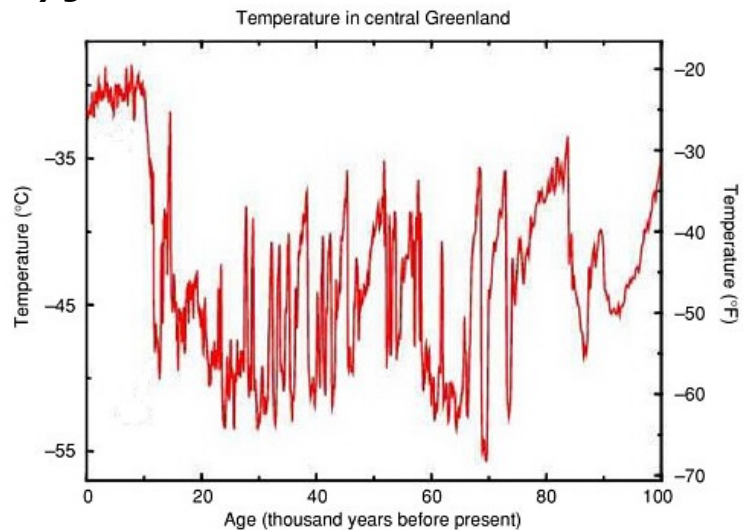
\* *Rapid warming 55.8 million years ago began at a time when temperatures at the equator were not very different from temperatures at the poles, but climate models cannot match those starting conditions, making it "unrealistic to simulate the further abrupt warming" that followed during that epoch.*

\* *Temperature records of the last ice age, from about 120,000 to 12,000 years ago, taken from ice cores and ocean sediments, show two types of abrupt change: numerous cold snaps and rapid warm episodes - gyrations of 20 degrees F or more - that theorists have a hard time explaining and modern climate models can't realistically replicate.*

\* *More recently, between 9,000 and 5,500 years ago, in the span of just a matter of decades, the climate system transformed the region of North Africa now known as the Sahara from a relatively wet, vegetated steppe into the vast, barren desert we see today. "Complex climate models fail to simulate the vegetated state," notes Valdes, "and can not therefore capture this event of rapid change."*

Valdes calls for more computing power, better scientific understanding of the mechanism of change in the climate system, better data for the computer models, and concludes:

"In the meantime, we need to be cautious. If anything, the models are underestimating change, compared with the geological record. According to the evidence from the past, Earth's climate is sensitive to small changes, whereas the climate models seem to require a much bigger disturbance to produce abrupt change. Simulations on the coming century with the current generation of complex models may be giving us a false sense of security."



## **Alzheimer's prevention in your pantry**

### **Tel Aviv University researcher discovers a cinnamon extract to inhibit progression of Alzheimer's disease**

Alzheimer's, the degenerative brain disorder that disrupts memory, thought and behavior, is devastating to both patients and loved ones. According to the Alzheimer's Association, one in eight Americans over the age of 65 suffers from the disease. Now Tel Aviv University has discovered that an everyday spice in your kitchen cupboard could hold the key to Alzheimer's prevention.

An extract found in cinnamon bark, called CEppt, contains properties that can inhibit the development of the disease, according to Prof. Michael Ovadia of the Department of Zoology at Tel Aviv University. His research, conducted in collaboration with Prof. Ehud Gazit, Prof. Daniel Segal and Dr. Dan Frenkel, was recently published in the journal PLoS ONE.

#### **Taking a cue from the ancient world**

Prof. Ovadia was inspired to investigate the healing properties of cinnamon by a passage in the Bible. It describes high priests using the spice in a holy ointment, he explains, presumably meant to protect them from infectious diseases during sacrifices. After discovering that the cinnamon extract had antiviral properties, Prof. Ovadia empirically tested these properties in both laboratory and animal Alzheimer's models.

The researchers isolated CEppt by grinding cinnamon and extracting the substance into an aqueous buffer solution. They then introduced this solution into the drinking water of mice that had been genetically altered to develop an aggressive form of Alzheimer's disease, and fruit flies that had been mutated with a human gene that also stimulated Alzheimer's disease and shortened their lifespan.

After four months, the researchers discovered that development of the disease had slowed remarkably and the animals' activity levels and longevity were comparable to that of their healthy counterparts. The extract, explains Prof. Ovadia, inhibited the formation of toxic amyloid polypeptide oligomers and fibrils, which compose deposits of plaque found in the brains of Alzheimer's patients.

In the test-tube model, the substance was also found to break up amyloid fibers, similar to those collected in the brain to kill neurons. According to Prof. Ovadia, this finding indicates that CEppt may not just fight against the development of the disease, but may help to cure it after Alzheimer's molecules have already formed. In the future, he says, the team of researchers should work towards achieving the same result in animal models.

#### **Adding a dash of cinnamon**

Don't rush to your spice cabinet just yet, however. It would take far more than a toxic level of the spice — more than 10 grams of raw cinnamon a day — to reap the therapeutic benefits. The solution to this medical catch-22, Prof. Ovadia says, would be to extract the active substance from cinnamon, separating it from the toxic elements.

"The discovery is extremely exciting. While there are companies developing synthetic AD inhibiting substances, our extract would not be a drug with side effects, but a safe, natural substance that human beings have been consuming for millennia," says Prof. Ovadia.

Though it can't yet be used to fight Alzheimer's, cinnamon still has its therapeutic benefits — it can also prevent viral infections when sprinkled into your morning tea.

[http://www.eurekalert.org/pub\\_releases/2011-06/ti-tia062711.php](http://www.eurekalert.org/pub_releases/2011-06/ti-tia062711.php)

## **Trudeau Institute announces new discovery in battle against plague and bacterial pneumonias**

### **Researchers have identified a new component of the plague causing bacterium that can be used as a vaccine**

Saranac Lake, N.Y. – Researchers from the Smiley lab at the Trudeau Institute have now identified a single component of the plague causing bacterium that can be used as a vaccine. This single "subunit" could potentially be used to create a safer form of a T cell-stimulating plague vaccine. The new data is featured in the July issue of The Journal of Immunology.

"To date, there has been little progress in the development of safe and effective vaccines for plague or similar bioweapons," said Dr. Stephen Smiley, a leading plague researcher and Trudeau Institute faculty member. "Our data identifies a single component of the plague causing bacterium seen by T cells. This could be a key discovery as we seek to develop a plague vaccine." The lab envisions that this subunit might be added to others already being studied for their ability to induce antibody responses. Together, these multiple subunits might safely induce both antibody and T cell responses, thereby better combating plague.

According to Dr. Smiley, there is no licensed plague vaccine in the United States. Together with postdoctoral associate Jr-Shiuan Lin, he is working to develop a vaccine that will protect members of the armed services and public from a "plague bomb."

Plague is caused by *Yersinia pestis*, arguably the most deadly bacteria known to man. *Yersinia pestis* infections of the lung, known as pneumonic plague, are extremely lethal and usually lead to death within a week of infection.

This could be a major discovery in the ongoing battle between scientists working to develop a vaccine to protect against plague and the terrorists who seek to use plague as a weapon. Many of the highest priority bio-terror concerns are caused by bacteria that acutely infect the lung. These include anthrax, tularemia and plague.

Most of the plague vaccine candidates that have been studied aim to stimulate B cells to produce plague-fighting antibodies. However, animal studies suggest that antibodies may not be enough to protect humans from pneumonic plague. The Smiley laboratory has shown that T cells can also fight plague. The lab previously demonstrated that an immunization with an experimental vaccine stimulates the production of T cells that provide partial protection against pneumonic plague. This vaccine consisted of a live but weakened version of the plague causing bacterium.

Live vaccines are often effective, but they can be difficult to license because they have the potential to grow within immunocompromised recipients and inadvertently cause disease.

Additionally, Dr. Smiley believes these studies may help us learn to combat other kinds of pneumonia: "Bacterial pneumonia is one of the most common causes of death in hospitals and, like plague, many of these pneumonias are caused by bacteria that we may need to combat with both antibodies and T cells."

*Dr. Smiley's studies are funded by the Trudeau Institute and grants from the National Institutes of Health.*

<http://www.newscientist.com/article/dn20618-the-first-advertising-campaign-for-nonhuman-primates.html>

### **The first advertising campaign for non-human primates**

**\* 15:49 27 June 2011 by Rowan Hooper**

***Keith Olwell and Elizabeth Kiehner had an epiphany last year. At a TED talk, the two New York advertising executives learned that captive monkeys understand money, and that when faced with economic games they will behave in similar ways to humans.***

So if they can cope with money, how would they respond to advertising?

Laurie Santos, the Yale University primatologist who gave the TED talk, studies monkeys as a way of exploring the evolution of the human mind. A partnership was soon born between Santos, and Olwell and Kiehner's company Proton. The resulting monkey ad campaign was unveiled on Saturday at the Cannes Lions Festival, the creative festival for the advertising industry.

#### **Monkey brands**

The objective, says Olwell, is to see if advertising can make brown capuchins change their behaviour. The team will create two brands of food – the team is considering making two colours of jello – specifically targeted at brown capuchins, one supported by an ad campaign and the other not.

How do you advertise to monkeys? Easy: create a billboard campaign that hangs outside the monkeys' enclosure. "The foods will be novel to them and are equally delicious," Olwell says. Brand A will be advertised and brand B will not. After a period of exposure to the campaign, the monkeys will be offered a choice of both brands. Santos plans to kick off the experimental campaign in the coming weeks. "If they tend toward one and not the other we'll be witnessing preference shifting due to our advertising," Olwell says.

#### **Sex sells**

Olwell says that developing a campaign for non-humans threw up some special challenges. "They do not have language or culture and they have very short attention spans," he says. "We really had to strip out any hip and current thinking and get to the absolute core of what is advertising. "We're used to doing fairly complex and nuanced work. For this exploration we had to constantly ask ourselves, 'Could we be less finessed?'. We wanted the most visceral approaches." New Scientist has seen the resulting two billboards. We are unable to show them until Santos and her team have completed their study, but we can reveal that their message is most certainly visceral. One billboard shows a graphic shot of a female monkey with her genitals exposed, alongside the brand A logo. The other shows the alpha male of the capuchin troop associated with brand A.

Olwell expects brand A to be the capuchins' favoured product. "Monkeys have been shown in previous studies to really love photographs of alpha males and shots of genitals, and we think this will drive their purchasing habits."

The team wanted shots for the campaign that were as natural as possible. "After we settled on what they were being sold and that we were going to be doing 'sex sells', we really wanted to make a very direct ad. We wanted to shoot our subjects involved in normal day-to-day life."

<http://www.physorg.com/news/2011-06-antibiotic-effective-salmonella.html>

## **Living antibiotic effective against Salmonella**

**Scientists have tested a predatory bacterium – Bdellovibrio – against Salmonella in the guts of live chickens.**

They found that it significantly reduced the numbers of Salmonella bacteria and, importantly, showed that Bdellovibrio are safe when ingested.

The research was funded by the Biotechnology and Biological Sciences Research Council, carried out by Professor Liz Sockett's team at The University of Nottingham, with Dr Robert Atterbury and Professor Paul Barrow at the University of Nottingham Vet School; and published in the journal Applied and Environmental Microbiology.

Researcher Dr Laura Hobley said "Bdellovibrio has the potential to be used as a living antibiotic against some major human and animal pathogens, such as E. coli and other so-called Gram-negative bacteria."

Previous studies have shown that Bdellovibrio is very effective at invading and killing other bacterial cells in a test tube. It looks likely to provide an alternative to antibiotic medicines at a time when bacterial resistance is a significant problem to human and animal health.

Dr Hobley continued "We think that Bdellovibrio could be particularly useful as a topical treatment for wounds or foot rots but we wanted to know what might happen if it is ingested – either deliberately as a treatment, or by accident."

Salmonella likes to grow in the guts of poultry and other animals and can cause food poisoning in humans. In lab experiments Bdellovibrio can kill Salmonella by breaking into the cells and destroying them from the inside. This research shows that it also works inside the gut of a bird and is safe, not harming them or changing their behaviour.

Bdellovibrio reduced the numbers of Salmonella by 90% and the birds remained healthy, grew well, and were generally in good condition.

"We concluded that Bdellovibrio aren't long lived in the bird guts – they had a strong effect for about 48 hours, which dropped off after this time. If we were to use this method to completely rid the birds of Salmonella, we might have to test a program of multiple dosing. But the point of this study was really to ensure that Bdellovibrio is safe and effective when ingested," said Dr Hobley.

Professor Douglas Kell, Chief Executive, BBSRC said "Once we have understood the fundamental nature of an extraordinary organism such as Bdellovibrio, it makes sense that we should look at potential uses for it. The impact of bacterial infections on human and animal health is significant and since antibiotic resistance is a major issue, alternatives from nature may become increasingly important."

*Provided by Biotechnology and Biological Sciences Research Council*

<http://news.discovery.com/earth/volcanoes-co2-people-emissions-climate-110627.html>

## **Humans Dwarf Volcanoes for CO2 Emissions**

**Human activities generate more of the greenhouse gas in under three days than volcanoes do in a year.**

**By Jessica Marshall | Mon Jun 27, 2011 03:33 PM ET**

Colossal, mind-bogglingly hot and capable of spewing billowing clouds of flight-grounding smoke and searing, molten lava, volcanoes are spectacular displays of the massive forces at work inside our planet. Yet they are dwarfed by humans in at least one respect: their carbon dioxide emissions.

Despite statements made by climate change deniers, volcanoes release a tiny fraction of the amount of carbon dioxide emitted by human activities every year.

In fact, humans release roughly 135 times more carbon dioxide annually than volcanoes do, on average, according to a new analysis. Put another way, humans emit in under three days the amount that volcanoes typically release in a year, according to the best estimates of volcanic emissions.

"The question of whether or not volcanoes emit more CO<sub>2</sub> than human activity is one I get more than any question in my email from the general public," said Terrence Gerlach, a retired volcanologist, formerly with the Cascades Volcano Observatory, part of the US Geological Survey in Vancouver, Wash. Even earth scientists who work in other areas often pose him the question, he said.

To lay out a clear answer, Gerlach compiled the available estimates of CO<sub>2</sub> emissions from all global volcanic activity on land and undersea and compared them with estimates for human emissions. He published the compilation in Eos, a publication of the American Geophysical Union.

Researchers estimate the amounts of carbon dioxide released by terrestrial volcanic eruptions by methods including remote sensing or flying through clouds of erupting volcanic gas, and by measuring certain isotope concentrations near undersea volcanoes. Carbon dioxide is dissolved in magma at great depths and is released

as the magma rises to the surface. "A lot of climate skeptics claim that volcanoes emit more CO<sub>2</sub> than humans do," Gerlach said. "They never give any numbers, but the fact is you will never be able to find the volcanic gas scientist that will agree to that," he said.

One example of these skeptic's claims is the 2009 book, "Heaven and Earth: Global Warming, the Missing Science" by Ian Plimer of the University of Adelaide, who did not respond to Discovery News' requests for comment. "The main reason, I think, that this myth persists," Gerlach said: "First of all, the emissions are extremely spectacular. When people see volcanic eruptions on television and it's awesome, and it's very easy for people to imagine that huge amounts of CO<sub>2</sub> are being emitted to the atmosphere."

"However, these spectacular volcanic explosions that are so stunning on TV last only a few hours," he added. "They are ephemeral. In contrast, the sources of anthropogenic CO<sub>2</sub> (smokestacks, exhaust pipes, etc) are comparatively unspectacular, commonplace, and familiar, and in addition they are ubiquitous, ceaseless, and relentless. They emit CO<sub>2</sub> 24/7."

While there is uncertainty in the measurements - researchers estimate between 0.13 and 0.44 billion metric tons per year, with their best estimates between 0.15 and 0.26 billion tons - even the highest end of the range is dwarfed by anthropogenic emissions of 35 billion metric tons in 2010.

Gerlach noted that human land-use changes alone, which include deforestation, release 3.5 billion metric tons per year. Cars and light-duty trucks produce 2 billion metric tons; even cement production produces 1.5 billion tons. Any of these by itself is still several times higher than the annual emissions of all of the world's volcanoes. Pakistan or Kazakhstan each produce about the amount of CO<sub>2</sub> as volcanoes do each year, Gerlach noted in the article.

In yet another comparison, Gerlach reported that in order for volcanic emissions to match those made by humans, the May 18, 1980, Mount St. Helens eruption would need to happen every 2.5 hours. The June 15, 1991, Mount Pinatubo eruption would need to occur every 12.5 hours.

"There is no way you can escape the fact that volcanoes are releasing a tiny amount of emissions right now," said Bernard Marty of the Centre de Recherches Petrographiques et Geochimiques in Nancy, France. "There is no doubt about this." "Even if you do the reverse and you compute how much volcanism should happen to match atmospheric levels, you end up with completely unrealistic eruption rates," he said.

Marie Edmonds, a volcanologist at Cambridge University agreed. While volcanoes are the most important natural source of atmospheric CO<sub>2</sub>, she noted, "The results show clearly that the amount is 100-150 times less than anthropogenic amounts."

[http://www.eurekalert.org/pub\\_releases/2011-06/fl-nss062811.php](http://www.eurekalert.org/pub_releases/2011-06/fl-nss062811.php)

**New study shows children and adolescents who eat candy are less overweight or obese**  
***Children and adolescents who eat candy tend to weigh less than their non-consuming counterparts, according to a new study published in Food & Nutrition Research, a peer-reviewed journal.***

This is potentially important news given the current state of the childhood obesity epidemic. But lead researcher Carol O'Neil, PhD, MPH, LDN, RD, Louisiana State University Agricultural Center, wants to ensure the study is put into perspective. "The study illustrates that children and adolescents who consume candy are less likely to be overweight or obese," O'Neil said. "However, the results of this study should not be construed as a hall-pass to overindulge. Candy should not replace nutrient-dense foods in the diet; it is a special treat and should be enjoyed in moderation."

Similar to a sister study that focused on adults (published earlier this year in Nutrition Research), this study examined the association of candy consumption on intakes of total energy, fat, and added sugars; diet quality; weight/adiposity parameters; and risk factors for cardiovascular disease in 11,182 U.S. children 2-13 years of age and adolescents 14-18 years of age participating in the 1999-2004 National Health and Nutrition Examination Survey (NHANES).

### **Striking a Balance: Candy and Health**

While children and adolescent candy consumers in the study did have slightly higher intakes of total energy and added sugars, they were 22 percent and 26 percent, respectively, less likely to be overweight or obese than non-candy consumers—suggesting their ability to successfully navigate the "calories in, calories out," balance over time. ***Specific findings include:***

\* Cardiovascular Risk Factors: It was a positive finding that C-reactive protein (CRP), a non-specific marker of inflammation and one way to assess risk for cardiovascular and other chronic diseases, was actually lower in sugar candy consumers. There were no other associations between candy consumption and cardiovascular risk factors, including no difference in blood pressure or blood lipid levels (a cholesterol indicator).

\* Diet Quality: Diet quality was measured by the Healthy Eating Index 2005, a standard created by the U.S. Department of Agriculture to assess conformance to federal dietary guidance. The study found overall, there was no difference in diet quality in candy consumers compared with non-consumers. It is worth noting however, that overall diet quality was very poor in all groups, regardless of whether candy was consumed.

\* Weight, Body Mass Index (BMI) and Waist Circumference: These key measures for overweight and obesity were lower for candy consumers as compared to non-consumers.

"Candy is a fun part of children's lives – as a treat, in celebrations and for holidays," said Alison Bodor, senior vice president of public policy and advocacy, National Confectioners Association. "It's not intended to replace nutrient-dense foods in the diet, but it certainly can provide moments of happiness within the context of a healthy lifestyle."

*The article abstract can be accessed here: <http://www.foodandnutritionresearch.net/index.php/fnr/article/view/5794>*

*FUNDING DISCLOSURE: The study is a publication of the United States Department of Agriculture (USDA/ARS) Children's Nutrition Research Center, Department of Pediatrics, Baylor College of Medicine, Houston, Texas. The contents of this publication do not necessarily reflect the views or policies of the USDA, nor does mention of trade names, commercial products, or organizations imply endorsement from the U.S. government.*

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[http://www.eurekalert.org/pub\\_releases/2011-06/qu-fyw062811.php](http://www.eurekalert.org/pub_releases/2011-06/qu-fyw062811.php)

### **Fidgeting your way to fitness**

#### ***Walking to the photocopier and fidgeting at your desk are contributing more to your cardiorespiratory fitness than you might think.***

Researchers have found that both the duration and intensity of incidental physical activities (IPA) are associated with cardiorespiratory fitness. The intensity of the activity seems to be particularly important, with a cumulative 30-minute increase in moderate physical activity throughout the day offering significant benefits for fitness and long-term health.

"It's encouraging to know that if we just increase our incidental activity slightly - a little bit more work around the house, or walking down the hall to speak with a co-worker as opposed to sending an email - we can really benefit our health in the long-term," says Ashlee McGuire, the study's lead researcher and a graduate student in the School of Kinesiology and Health Studies. "Best of all, these activities don't take up a lot of time, they're not difficult to do, and you don't have to go to a gym."

Ms McGuire and fellow researcher Robert Ross, a professor in the School of Kinesiology and Health Studies, define IPA as non-purposeful physical activity accrued through activities of daily living, such as doing housework, climbing stairs or walking around the office.

Since a large proportion of the Canadian population doesn't participate in a more structured, higher intensity exercise regime, Ms McGuire and Dr. Ross wanted to find out whether the time and intensity of incidental physical activity had any impact on cardiorespiratory fitness.

None of the study's participants met Canada's physical activity guidelines and were engaging solely in incidental physical activity. Activity levels were gauged using an accelerometer, which measures the duration and intensity of movement. Participants wore the accelerometer for a week and also took part in a test to measure their cardiorespiratory fitness. These findings were recently published in *Medicine & Science in Sports & Exercise*, the journal of the American College of Sports Medicine.

[http://www.eurekalert.org/pub\\_releases/2011-06/uow-wsi062811.php](http://www.eurekalert.org/pub_releases/2011-06/uow-wsi062811.php)

#### ***Wars steadily increase for over a century, fed by more borders and cheaper conflict New research by the University of Warwick and Humboldt university shows that the frequency of wars between states increased steadily from 1870 to 2001 by 2% a year on average.***

The research argues that conflict is being fed by economic growth and the proliferation of new borders.

We may think the world enjoyed periods of relative freedom from war between the Cold War and 9/1 but the new research by Professor Mark Harrison from at the University of Warwick's the Centre for Competitive Advantage in the Global Economy, and Professor Nikolaus Wolf from Humboldt University, shows that the number of conflicts between pairs of states rose steadily from 6 per year on average between 1870 and 1913 to 17 per year in the period of the two World Wars, 31 per year in the Cold War, and 36 per year in the 1990s.

Professor Mark Harrison from the University of Warwick said: "The number of conflicts has been rising on a stable trend. Because of two world wars, the pattern is obviously disturbed between 1914 and 1945 but remarkably, after 1945 the frequency of wars resumed its upward course on pretty much the same path as before 1913."

One of the key drivers is the number of countries, which has risen dramatically - from 47 in 1870 to 187 in 2001.

Professor Mark Harrison added: "More pairs of countries have clashed because there have been more pairs. This is not reassuring: it shows that there is a close connection between wars and the creation of states and new borders. Besides, no matter how you divide it, we have only one planet. Our planet has already seen two world wars. As that experience suggests, you can never be quite sure what little conflicts will not suddenly snowball into much wider, more deadly struggles."

The fact that inspired the research is illustrated in the figure. The number of conflicts between pairs of states around the world has been rising since 1870. ("Pairwise conflicts" are measured by the number of pairs of countries in conflicts. Conflicts include everything from full-scale shooting wars and uses of military force to displays of force such as sending warships and closing borders.

This doesn't measure the intensity of violence, but it does capture the readiness of governments to settle disputes by force. Because we look only at wars between states, civil wars are not counted.)

When the researchers have discussed their work with colleagues, the most frequent questions have been about the extra wars since 1945: "Aren't these just America's wars?" and "Aren't these just coalition wars in which many far flung countries join symbolically, yet most never fire a shot?" "No" is the answer to both these questions. If one removes "America's wars" altogether from the data, it makes no difference: the rising trend is still there.

Other scholars have shown that the average distance between countries at war has fallen steadily since the 1950s. Looking specifically at the countries that have initiated disputes, the researchers show, larger countries (defined by GDP) have tended to make more frequent military interventions, but there has been no increase in this tendency over the 130 years of their study. They also show there is no tendency for richer countries (defined by GDP per head) to make war more often than others, and again this has not changed over 130 years. In other words, the readiness to embark on military adventures is scattered fairly uniformly across the global income distribution.

This raises two sorts of problems. One is that it's somewhat alarming. The other is that it's a bit of a puzzle. Much of what we know, or think we know, says this should not be happening. The countries of the world have tended to become richer, more democratic, and more interdependent. The thinkers of the Enlightenment held that these things ought generally to make the world more peaceful. Much political science is built on the idea that the political leaders of richer, more democratic countries have fewer incentives to make war and are more constrained from doing so.

Professor Mark Harrison said: "We do not think these ideas are wrong, but they are incomplete. Without being certain of the answer, we think political scientists have focused too much on preferences for war (the "demand side") and not enough on capabilities (the "supply side"). Capabilities may be the missing factor in the story of the rising frequency of wars. We argue that the same factors that should have depressed the incentives for rulers to choose conflict are also increasing the capacity for war. In other words, we are making war more frequently, not because we want to, but because we can."

The research gives three explanations for this. Firstly, economic growth has made destructive power cheaper, not just absolutely cheaper but cheaper relative to civilian goods. Second, the key to modern states' acquisition of destructive power was the ability to tax and borrow more than ever before, and the growth of fiscal capacity was hugely assisted by the rise of democracy. Third, war is disruptive of trade, but those countries that succeeded in maintaining external trading links in wartime could wage war more effectively.

Professor Mark Harrison concluded: "In other words, the very things that should make politicians less likely to want war – productivity growth, democracy, and trading opportunities – have also made war cheaper. We have more wars, not because we want them, but because we can. Finally, under present international arrangements this deep seated tendency is not something that any one country is going to be able to control."

*The full paper entitled the "The frequency of wars," by Mark Harrison and Nikolaus Wolf, is forthcoming in the Economic History Review. Weblink: <http://go.warwick.ac.uk/markharrison/public/ehr2011postprint.pdf>*

[http://www.eurekalert.org/pub\\_releases/2011-06/ohs-rao062811.php](http://www.eurekalert.org/pub_releases/2011-06/ohs-rao062811.php)

### **Researchers at Oregon Health & Science University discover MS-like disease in monkeys Findings could lead to major advance in MS research in humans**

Portland, Ore. — Researchers at Oregon Health & Science University have discovered a naturally occurring disease in monkeys that is very much like multiple sclerosis in humans — a discovery that could have a major impact on efforts to understand the cause of multiple sclerosis.

The disease that the researchers discovered in monkeys at OHSU's Oregon National Primate Research Center is associated with a herpes virus that could give significant clues into how multiple sclerosis develops in

humans. MS researchers have long believed that a type of herpes virus may trigger multiple sclerosis in people who are genetically susceptible to the disease. The OHSU researchers' findings were published online today in the *Annals of Neurology*.

"These findings could have a huge impact on our understanding of MS and could be a landmark in someday developing more effective treatments for the disease, or even methods to prevent the onset of MS," said Scott Wong, Ph.D., senior author of the study and a scientist at the Vaccine and Gene Therapy Institute and the Oregon National Primate Research Center.

Both elements of the OHSU discovery are important for MS researchers. Before the OHSU findings, researchers had been able to study MS-like diseases in nonhuman primates only after the disease had been artificially induced. A naturally occurring disease, such as the one discovered at OHSU, can give researchers many more clues into the causes and development of the disease.

"Now, we may be able to tease apart what's triggering the onset of the disease," Wong said. And the fact that the disease, found in a small percentage of the Japanese macaques at OHSU each year, came from a herpes virus could prove hugely important to MS researchers worldwide. Researchers can now search for a similar virus in MS patients. The cause of MS, which affects about 400,000 people in the United States, is unknown. But researchers have long believed that a virus, possibly a herpes virus, might trigger the disease in people who are genetically susceptible.

"Understanding how this herpes virus causes the MS-like disease in the monkeys will give us important new knowledge — and drive new research that could lead to significant advancements in finding and preventing the virus that might cause MS," said Dennis Bourdette, M.D., a co-author of the study, director of the Multiple Sclerosis Center of Oregon and professor and chairman of the OHSU Department of Neurology.

From 1986 through 2010, 56 of the Japanese macaque monkeys at the Oregon National Primate Research Center at OHSU spontaneously developed paralysis in their hind limbs, along with other symptoms. The monkeys were humanely euthanized because they could not have been returned to the monkey colony safely. Researchers later did necropsies on their bodies and performed MRI scans on eight of the animals.

That work and other testing allowed researchers to discover that an MS-like disease called Japanese macaque encephalomyelitis was causing the paralysis. While the disease typically afflicted young adult animals, it also was present in juveniles and older animals, and was present in both males and females.

About 1 to 3 percent of the more than 300 Japanese macaques at the primate center develop the disease each year, according to the researchers. With this discovery, MS researchers now will be able to move toward trying to prevent or treat the virus in monkeys, which might help scientists make progress in treating MS in humans. *In addition to Wong and Bourdette, co-authors of the study include Michael Axthelm, D.V.M., Ph.D., of the Vaccine and Gene Therapy Institute; William Rooney, Ph.D., of OHSU's Advanced Imaging Research Center; and Larry Sherman, Ph.D., of the Oregon National Primate Research Center.*

*The research was supported by the National Institutes of Health, the Research Enrichment Award Program of the Department of Veterans Affairs Biomedical Laboratory Research and Development, the OHSU Multiple Sclerosis Center, and the United States Department of Defense. The study is titled "Japanese macaque encephalomyelitis: a spontaneous multiple sclerosis-like disease."*

[http://www.eurekalert.org/pub\\_releases/2011-06/e-dlt062911.php](http://www.eurekalert.org/pub_releases/2011-06/e-dlt062911.php)

## **Dyslexia linked to difficulties in perceiving rhythmic patterns in music**

### ***Early musical games may offer benefits in learning to read***

Milan, Italy - Children with dyslexia often find it difficult to count the number of syllables in spoken words or to determine whether words rhyme. These subtle difficulties are seen across languages with different writing systems and they indicate that the dyslexic brain has trouble processing the way that sounds in spoken language are structured. In a new study published in the June issue of Elsevier's *Cortex*, researchers at Cambridge have shown, using a music task, that this is linked to a broader difficulty in perceiving rhythmic patterns, or metrical structure.

Martina Huss, Usha Goswami and colleagues gave a group of 10-year-old children, with and without dyslexia, a listening task involving short tunes that had simple metrical structures with accents on certain notes. The children had to decide whether a pair of tunes sounded similar or different. To make two tunes sound "different", the researchers varied the length of the stronger notes. However, it was not the perception of the length of these notes that was shown to affect how successful a child completed the task, but the child's perception of "rise time", which is the time it takes for a sound to reach its peak intensity. In speech, for example, the rise time of a syllable is the time it takes to produce a vowel. Stressed syllables have longer rise times, so rise time is a critical cue that helps in the perception of rhythmic regularity in speech.



The children with dyslexia found the music task quite difficult, even when presented with simple tunes containing just a few notes. The findings of the study indeed showed a strong relationship between the ability to perceive metrical structure in music and learning to read.

The researchers argue that the ability to perceive the alternation of strong and weak "beats" (stressed and unstressed syllables) is critical for the efficient perception of phonology in language. Furthermore, as rhythm is more overt in music than language, they suggest that early interventions based on musical games may offer previously unsuspected benefits for learning to read.

[http://www.eurekalert.org/pub\\_releases/2011-06/nci-ss2062711.php](http://www.eurekalert.org/pub_releases/2011-06/nci-ss2062711.php)

## **Study shows 20 percent reduction in lung cancer mortality with low-dose CT vs chest X-ray**

***Scientists have found a 20 percent reduction in deaths from lung cancer among current or former heavy smokers who were screened with low-dose helical computed tomography (CT) versus those screened by chest X-ray.***

The primary research results from the National Lung Screening Trial (NLST) were published online today in the New England Journal of Medicine. This article provides a more extensive analysis of the data originally reported in November 2010 while providing additional data to the public and research community without barriers to access. Sponsored by the National Cancer Institute (NCI), part of the National Institutes of Health, the NLST is a nearly decade-long study that establishes low-dose helical CT as the first validated screening test which can reduce mortality due to lung cancer.

"Today's publication gives researchers, policy makers, and the public full access to primary findings from the NLST to guide the use of low-dose helical CT scanning by current and former smokers," said Harold Varmus, M.D., NCI director. "The NCI marshaled the scientific and financial resources required for this expansive study, because only trials such as this allow us to say which methods of screening are effective, and how effective, in defined populations. Having a validated screening test that provides significant, but partial, protection against death from lung cancer complements – but should not be seen as replacing – ongoing efforts to control use of tobacco and to find other ways to prevent and treat lung cancer."

The NLST was a randomized national trial involving 53,454 current and former heavy smokers ages 55 to 74. Participants were required to have a smoking history of at least 30 pack-years and were either current or former smokers without signs, symptoms, or history of lung cancer. Pack-years are calculated by multiplying the average number of packs of cigarettes smoked per day by the number of years a person has smoked.

Participants in the NLST were randomly assigned to receive three annual screens with either low-dose helical CT (often referred to as spiral CT) or standard chest X-ray. Helical CT uses X-rays to obtain a multiple-image scan of the entire chest, while a standard chest X-ray produces a single image of the whole chest in which anatomic structures overlie one another.

The paper published today provides important details about the number of screens that identified abnormalities potentially related to lung cancer (positive screens) and how many of those positive screens turned out to be false positives, meaning that the positive finding did not prove to be lung cancer upon follow-up. On average over the three rounds of screening exams, 24.2 percent of the low-dose helical CT screens were positive and 6.9 percent of the chest X-rays were positive. In both arms of the trial, the majority of positive screens led to additional tests.

Across all three rounds, when a positive screening result was found, 96.4 percent of the low-dose helical CT tests and 94.5 percent of the chest X-ray exams were false positive. The vast majority of false positive results was probably due to the detection of normal lymph nodes or inflamed tissues. False positive results not due to lung cancer were typically confirmed by follow-up CT scans that showed no change in the finding over time.

The published results also provide insight into the type of lung cancers found by screening and the stages at which they were diagnosed. Adenocarcinomas, which begin in cells that line the lungs, and squamous cell carcinomas, which arise from the thin, flat fish-scale-like cells that line passages of the respiratory tract, were detected in the early stages of disease in both arms of the trial. Both types of lung cancer were detected more frequently at the earliest stage by low-dose helical CT compared to chest X-ray. Small-cell lung cancers, which are very aggressive tumors and grow in the tissues of the lung, were infrequently detected at early stages by low-dose helical CT or chest X-ray. Knowing what types of lung cancers are detectable and at what stage they are most detectable by different screening modalities should help researchers refine the use of these tools for future patients.

Additional studies based on the complete NLST data set are ongoing and will include reports on cost-effectiveness of low-dose helical CT as well as the ability to use the data to develop models that may help indicate whether other groups of smokers, such as light smokers or younger smokers, would benefit from

screening with low-dose helical CT. Other modeling studies are expected to examine the optimal frequency and duration of screening.

Adverse events, which are harms from the actual screening examinations, were few and relatively minor in the NLST. The rate of complications among people who underwent a diagnostic evaluation prompted by a positive screen was under 2 percent for either type of screening. Among those who did have complications, 16 people screened with low-dose helical CT (10 of whom had lung cancer) and 10 chest X-ray participants (all with lung cancer) died within 60 days of a follow-up invasive diagnostic procedure.

Invasive diagnostic procedures include bronchoscopy, where an instrument is inserted through the nose or mouth into the airways, and percutaneous lung needle biopsy, where a needle is inserted into the lung through the chest to remove a small piece of tissue for examination. While it is not known whether the diagnostic procedures caused these deaths, the low frequency of death within 60 days of an invasive procedure in the NLST suggests that death following evaluation of positive screens occurs rarely.

Radiation exposure associated with low-dose helical CT in the NLST is much lower than that associated with a regular diagnostic chest CT. The authors note any harm from exposure to radiation during the screenings could not be measured directly. Because the effect of such exposure is a long-term outcome, potential harms will need to be modeled in future studies.

It should also be noted that the population enrolled in this study, while ethnically representative of the U.S. population of smokers at high risk for lung cancer, was a highly motivated and primarily urban group that was screened at major medical centers. Thus, these results alone may not accurately predict the effects of recommending low-dose helical CT scanning for other populations.

"These primary findings from the NLST provide a valuable insight into how to potentially decrease death due to lung cancer. But the most important method of decreasing lung cancer rates remains for smokers to quit smoking and for those who don't smoke to continue with their healthy behaviors," said NLST co-investigator, Christine Berg, M.D., of the NCI.

*The NLST was conducted by the American College of Radiology Imaging Network, a medical imaging research network focused on the conduct of multi-center imaging clinical trials, and the Lung Screening Study group, which was initially established by the NCI to examine the feasibility of the NLST.*

*Reference: National Lung Screening Trial Research Team. Reduced Lung-Cancer Mortality with Low-Dose Computed Tomographic Screening. NEJM. Online June 29, 2011. In print, August 4, 2011.*

[http://www.eurekalert.org/pub\\_releases/2011-06/e-mdq062711.php](http://www.eurekalert.org/pub_releases/2011-06/e-mdq062711.php)

### **Most distant quasar found**

***"This quasar is a vital probe of the early Universe. It is a very rare object that will help us to understand how supermassive black holes grew a few hundred million years after the Big Bang," says Stephen Warren, the study's team leader.***

Quasars are very bright, distant galaxies that are believed to be powered by supermassive black holes at their centres. Their brilliance makes them powerful beacons that may help to probe the era when the first stars and galaxies were forming. The newly discovered quasar is so far away that its light probes the last part of the reionisation era <sup>[1]</sup>.

The quasar that has just been found, named ULAS J1120+0641 <sup>[2]</sup>, is seen as it was only 770 million years after the Big Bang (redshift 7.1, <sup>[3]</sup>). It took 12.9 billion years for its light to reach us.

Although more distant objects have been confirmed (such as a gamma-ray burst at redshift 8.2, [eso0917](#), and a galaxy at redshift 8.6, [eso1041](#)), the newly discovered quasar is hundreds of times brighter than these. Amongst objects bright enough to be studied in detail, this is the most distant by a large margin.

The next most-distant quasar is seen as it was 870 million years after the Big Bang (redshift 6.4). Similar objects further away cannot be found in visible-light surveys because their light, stretched by the expansion of the Universe, falls mostly in the infrared part of the spectrum by the time it gets to Earth. The European UKIRT Infrared Deep Sky Survey (UKIDSS) which uses the UK's dedicated infrared telescope <sup>[4]</sup> in Hawaii was designed to solve this problem. The team of astronomers hunted through millions of objects in the UKIDSS database to find those that could be the long-sought distant quasars, and eventually struck gold.

"It took us five years to find this object," explains Bram Venemans, one of the authors of the study. "We were looking for a quasar with redshift higher than 6.5. Finding one that is this far away, at a redshift higher than 7, was an exciting surprise. By peering deep into the reionisation era, this quasar provides a unique opportunity to explore a 100-million-year window in the history of the cosmos that was previously out of reach."

The distance to the quasar was determined from observations made with the FORS2 instrument on ESO's Very Large Telescope (VLT) and instruments on the Gemini North Telescope <sup>[5]</sup>. Because the object is

comparatively bright it is possible to take a spectrum of it (which involves splitting the light from the object into its component colours). This technique allowed the astronomers to find out quite a lot about the quasar.

These observations showed that the mass of the black hole at the centre of ULAS J1120+0641 is about two billion times that of the Sun. This very high mass is hard to explain so early on after the Big Bang. Current theories for the growth of supermassive black holes predict a slow build-up in mass as the compact object pulls in matter from its surroundings.

"We think there are only about 100 bright quasars with redshift higher than 7 over the whole sky," concludes Daniel Mortlock, the leading author of the paper. "Finding this object required a painstaking search, but it was worth the effort to be able to unravel some of the mysteries of the early Universe."

<sup>[1]</sup> About 300 000 years after the Big Bang, which occurred 13.7 billion years ago, the Universe had cooled down enough to allow electrons and protons to combine into neutral hydrogen (a gas without electric charge). This cool dark gas permeated the Universe until the first stars started forming about 100 to 150 million years later. Their intense ultraviolet radiation slowly split the hydrogen atoms back into protons and electrons, a process called reionisation, making the Universe more transparent to ultraviolet light. It is believed that this era occurred between about 150 million to 800 million years after the Big Bang.

[http://www.eurekalert.org/pub\\_releases/2011-06/uoa-nfd062911.php](http://www.eurekalert.org/pub_releases/2011-06/uoa-nfd062911.php)

### **New fossils demonstrate that powerful eyes evolved in a twinkling Palaeontologists have uncovered half-a-billion-year-old fossils demonstrating that primitive animals had excellent vision.**

An international team led by scientists from the South Australian Museum and the University of Adelaide found the exquisite fossils, which look like squashed eyes from a recently swatted fly.

This discovery will be published tomorrow (Thursday 30 June 2011) in the prestigious journal Nature.

The lead author is Associate Professor Michael Lee from the South Australian Museum and the University of Adelaide's School of Earth & Environmental Sciences.

#### **Compound Eyes**

Modern insects and crustaceans have "compound eyes" consisting of hundreds or even thousands of separate lenses. They see their world as pixels – each lens produces a pixel of vision. More lenses mean more pixels and better visual resolution. (Each lens does not form a miniature image – a myth often perpetuated by Hollywood.)



*A half-billion-year-old fossil compound eye, showing exquisite detail of the visual surface (the individual lenses can be seen as darker spots). Photo by John Paterson (University of New England).*

#### **Evolutionary Advantage**

The fossil compound eyes were found on Kangaroo Island, South Australia and are 515 million years old. They have over 3000 lenses, making them more powerful than anything from that era, and probably belonged to an active predator that was capable of seeing in dim light.

Their discovery reveals that some of the earliest animals possessed very powerful vision; similar eyes are found in many living insects, such as robber flies. Sharp vision must therefore have evolved very rapidly, soon after the first predators appeared during the 'Cambrian Explosion' of life that began around 540 million years ago.

Given the tremendous adaptive advantage conferred by sharp vision for avoiding predators and locating food and shelter, there must have been tremendous evolutionary pressure to elaborate and refine visual organs.

#### **Who owned them?**

As the fossil eyes were found isolated, it's not certain what animal they came from, but they probably belonged to a large shrimp-like creature. The rocks containing the eyes also preserve a dazzling array of ancient marine creatures, many new to science. They include primitive trilobite-like creatures, armored worms, and large swimming predators with jointed feeding appendages.



*The recently discovered fossil eyes would have seen the world with over 3000 pixels (center image), giving its owner a huge visual advantage over its contemporaries, which would have seen a very blurry world with about 100 pixels (left image). This is much better than the living horseshoe crab, which sees the world as 1,000 pixels, but not as good as living dragonflies, which have the best compound eyes and see the world as ~28,000 pixels (right image). Image by*

*Thierry Laperousaz (South Australian Museum) and Mike Lee (South Australian Museum/University of Adelaide).*

## More pixels: more chance of survival

The recently discovered fossil eyes would have seen the world with over 3000 pixels, giving its owner a huge visual advantage over its contemporaries, which would have seen a very blurry world with about 100 pixels. This is much better than the living horseshoe crab, which sees the world as 1000 pixels, but not as good as living dragonflies, which have the best compound eyes and see the world as ~28 000 pixels.

*Authors: Dr Michael Lee (South Australian Museum and University of Adelaide – School of Earth & Environmental Sciences), with Dr John Paterson (University of New England), Dr Jim Jago (South Australian Museum and UniSA), Dr Diego Garcia-Bellido (Instituto de Geología Económica, Madrid), Dr Greg Edgecombe (Natural History Museum, London), and Dr Jim Gehling (South Australian Museum).*

<http://www.economist.com/node/18864332>

## Acid tests

### **Research into hallucinogenic drugs begins to shake off decades of taboo**

THE psychedelic era of the 1960s is remembered for its music, its art and, of course, its drugs. Its science is somewhat further down the list. But before the rise of the counterculture, researchers had been studying LSD as a treatment for everything from alcoholism to obsessive-compulsive disorder (OCD), with promising results.

Timothy Leary, a psychologist at Harvard University, was one of the best-known workers in the field, but it was also he who was widely blamed for discrediting it, by his unconventional research methods and his lax handling of drugs. Now, the details of Leary's research will be made public, with the recent purchase of his papers by the New York Public Library. These papers will be interesting not only culturally, but also scientifically, as they reflect what happened between the early medical promise of hallucinogens and their subsequent blacklisting by authorities around the world.

American researchers began experimenting with LSD in 1949, at first using it to simulate mental illness. Once its psychedelic effects were realised, they then tried it in psychotherapy and as a treatment for alcoholism, for which it became known at the time as a miracle cure.

By 1965 over 1,000 papers had been published describing positive results for LSD therapy. It, and its close chemical relative psilocybin, isolated from hallucinogenic mushrooms, were reported as having potential for treating anxiety disorders, OCD, depression, bereavement and even sexual dysfunction. Unfortunately, most of the studies that came to these conclusions were flawed: many results were anecdotal, and control groups were not established to take account of the placebo effect.

Still, the field was ripe for further study. But alongside growing public fear of LSD, Leary's leadership had become a liability. He was seen less and less as a disinterested researcher, and more and more as a propagandist. In 1962, amid wide publicity, the Harvard Psilocybin Project was shut down. Leary took his research to an estate in upstate New York, where he also hosted a stream of drug parties. Eventually both LSD and psilocybin were proscribed. Which was a pity because, like many other drugs the authorities have taken against as a result of their recreational uses, hallucinogens have medical applications as well. But time heals all wounds and now, cautiously, study of the medical use of hallucinogens is returning.

Psilocybin has shown promise in treating forms of OCD that are resistant to other therapies, in relieving cluster headaches (a common form of chronic headache) and in alleviating the anxiety experienced by terminally ill cancer patients. The first clinical study of LSD in over 35 years, also on terminally ill patients, is expected to finish this summer. Peter Gasser, the Swiss doctor leading the experiment, says that a combination of LSD and psychotherapy reduced anxiety levels of all 12 participants in the study, though the statistical significance of the data has yet to be analysed.

Research into LSD is not confined to medicine. Franz Vollenweider, of the Heffter Research Institute in Zurich, for example, is scanning people's brains to try to understand how hallucinogenic drugs cause changes in consciousness. And biotechnology may lead to a new generation of hallucinogenic drugs. Edwin Wintermute and his colleagues at Harvard have engineered yeast cells to carry out two of six steps in the pathway needed to make lysergic acid, the precursor of LSD. They hope to add the other four shortly. Once the pathway has been created, it can be tweaked. That might result in LSD-like drugs that are better than the original.

Even if that does not happen, making lysergic acid in yeast is still a good idea. The chemical is used as the starting point for other drugs, including nicergoline, a treatment for senile dementia. The current process for manufacturing it is a rather messy one involving ergot, a parasite of rye.

It may, of course, be that LSD has no clinical uses. Even when no stigma attaches to the drugs involved, most clinical trials end in failure. But it is worth seeing whether LSD might fulfil its early promise. And if the publication of Leary's archive speeds that process up by exorcising a ghost that still haunts LSD research, then the New York Public Library will have done the world a service.

<http://news.discovery.com/tech/electrode-wristband-stimulates-guitar-picking-110629.html>

## Electrode Wristband Stimulates Guitar-Picking

By Nic Halverson | Wed Jun 29, 2011 02:40 PM ET

***These days, its just as easy to play an instrument by not playing an instrument.***

With the popularity of Guitar Hero and countless music making apps for the iPad, modern technology has provided us with the existential achievement of "being a musician" by "not a being a musician."

Learning to play a real guitar? Who has time for that? Better to just strap a couple dozen electrodes to your arm and have them zap your finger muscles into forming the right chords.

Developed jointly by the University of Tokyo and Sony Computer Science Laboratories, the PossessedHand does just that. Around their forearm, users wear a belt containing 28 electrodes that stimulate muscles to flex the joints between the three bones of each finger and the two bones of the thumb. As well, the device also provides two wrist movements.

According the New Scientist, lead researcher Emi Tamaki said "The user's fingers are controlled without the user's mind."

PossessedHand improves upon previously finger-stimulating devices that used electrodes embedded in the skin or cumbersome glove-like devices that made it difficult to play instruments. Tamaki said her new device is far more comfortable. "The electric stimulations are similar to low-frequency massage stimulations that are commonly used," she said.

Understandably, some users found the device's ability to 'possess' their hand somewhat unnerving. "I felt like my body was hacked," said one subject.

However, Tamaki is confident that people will warm up to the idea once they see how useful it can be. "We believe convenient technology will overcome a feeling of fear," she said.

<http://www.bbc.co.uk/nature/13958630>

## 'Singing penis' sets noise record for water insect

By Ella Davies Reporter, BBC Nature

***A tiny water boatman is the loudest animal on Earth relative to its body size, a study has revealed.***

Scientists from France and Scotland recorded the aquatic animal "singing" at up to 99.2 decibels, the equivalent of listening to a loud orchestra play while sitting in the front row. The insect makes the sound by rubbing its penis against its abdomen in a process known as "stridulation". Researchers say the song is a courtship display performed to attract a mate. *Micronecta scholtzi* are freshwater insects measuring just 2mm that are common across Europe.

In a study published in the journal PLoS One, the scientists discovered that the small animals make a mighty sound. The team of biologists and engineering experts recorded the insects using specialist underwater microphones. On average, the songs of *M. scholtzi* reached 78.9 decibels, comparable to a passing freight train.

"We were very surprised. We first thought that the sound was coming from larger aquatic species such as a *Sigara* species [of] lesser water boatmen," said engineering expert Dr James Windmill from the University of Strathclyde, Glasgow. "When we identified without any doubt the sound source, we spent a lot of time making absolutely sure that our recordings of the sounds were calibrated correctly."

***Micronecta scholtzi Tiny bugs make huge sounds with a surprising organ*** Jerome Sueur

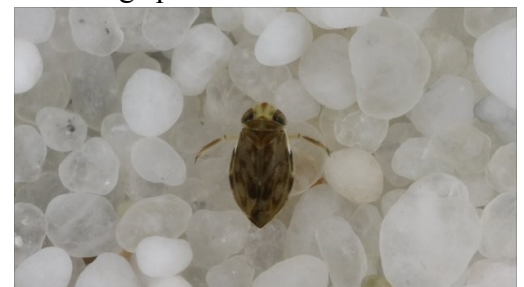
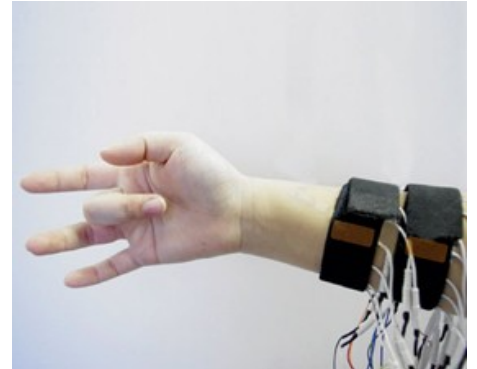
Dr Windmill explained that the reason the insects don't deafen us is down to the bug's underwater lifestyle.

Although 99% of the sound is lost when transferring from water to air, the songs were still loud enough to be audible to the human ear. "The song is so loud that a person walking along the bank can actually hear these tiny creatures singing from the bottom of the river," said Dr Windmill.

The majority of the loudest animals on Earth are also the biggest, with blue whale songs reaching 188 dB and elephants' rumbling calls measuring 117 dB.

Although remarkable acoustic signals are made by a range of invertebrates, including the miniature cricket and preying mantis, and by large mammals, none compare to *M. scholtzi* once body size is taken into account.

"If you scale the sound level they produce against their body size, *Micronecta scholtzi* are the loudest animals on Earth," said Dr Windmill.



Researchers believe that sexual selection could be the reason why the insects' songs reach such high amplitude. "We assume that this could be the result of a runaway selection," biologist and co-author Dr Jerome Sueur from the Museum of Natural History, Paris, told the BBC. "Males try to compete to have access to females and then try to produce a song as loud as possible potentially scrambling the song of competitors."

Dr Sueur explained that the competition could have exaggerated the volume of males' songs over time.

In many insects, the song volume is limited because predators would hear them, but observations suggest that *M. scholtzi* lack auditory predators.

### Modifications

To produce the intense sound, the water boatmen "stridulate" by rubbing a ridge on their penis across the ridged surface of their abdomen. "There is at least another one insect producing sound with its genitalia. This is a pyralid moth, *Syntonarcha iriastis*, that uses highly modified genitalia to produce ultrasonic signals," explained Dr Sueur. "Insects seem to be able to use any part of their body to generate sound. Some of them use their wings, others their legs, abdomen, head, wings, thorax etcetera."

What makes *M. scholtzi* extraordinary is that the area they use to create sound only measures about 50 micrometres across, roughly the width of a human hair. "We really don't know how they make such a loud sound using such a small area," said Dr Windmill.

Without any obvious adaptations to amplify the sound, the question of how the animals physically make such a loud call remains a mystery. "These very small bugs create sound at very high level, and it could be very useful for future ultrasonic systems to learn how they do that," said Dr Windmill.

[http://www.eurekalert.org/pub\\_releases/2011-06/dnal-xrp062711.php](http://www.eurekalert.org/pub_releases/2011-06/dnal-xrp062711.php)

### X-rays reveal patterns in the plumage of the first birds

**Menlo Park, Calif. - Scientists report today that they have taken a big step in determining what the first birds looked like more than 100 million years ago, when their relatives, the dinosaurs, still ruled the Earth.**

At the Department of Energy's SLAC National Accelerator Laboratory, they discovered chemical traces of a pigment, an important component of color, that once formed patterns in the feathers of the fossilized birds. The pigment, eumelanin, is one of the coloring agents responsible for brown eyes and dark hair in many modern species, including humans. It would have been one of the factors that determined the birds' color patterns, along with structural properties of the birds' feathers and other pigments they ingested as part of their diets.

The discovery, reported June 30 in *Science Express*, will help give textbook illustrators, diorama makers and Hollywood special-effects artists a more realistic palette for their depictions of ancient animals. Understanding these pigment patterns is important for science, too, since they play a role in a wide range of behaviors that are important in evolution such as camouflage, communication and selecting mates.

"This is a pigment that evolved a very, very long time ago but is still actively synthesized by organisms on the planet, and we found a way to map it and show its presence over 120 million years of geological time passing," said geochemist Roy Wogelius of the University of Manchester, one of the leaders of an international team that reported the discovery. "It is a direct relationship between you, me, and some extremely old organisms."

Said report co-author Uwe Bergmann of SLAC, "If we could eventually give colors to long extinct species, that in itself would be fantastic. Synchrotron radiation has revolutionized science in many fields, most notably in molecular biology. It is very exciting to see that it is now starting to have an impact in paleontology, in a way that may have important implications in many other disciplines."

Working at SLAC's Stanford Synchrotron Radiation Lightsource, the researchers examined two fossilized birds. *Confuciusornis sanctus*, which lived 120 million years ago, was one of many evolutionary links between dinosaurs and birds, sporting the first known bird-like beak. *Gansus yumenensis*, considered the oldest modern bird, lived more than 100 million years ago and looked a bit like a modern grebe.

Scientists had previously found melanosomes—the biological "paint pots" where melanin pigments are made and stored—in both ancient and living organisms. They used information about the structures of the melanosomes to make an educated guess about the colors of the pigments inside. But the newly published research shows that this prior approach has limitations. The team looked instead for chemical traces of the pigments themselves with two sophisticated X-ray techniques developed at SSRL.

### STRIDULATION FACTS

*Stridulation is the act of rubbing two body parts together to produce a sound*  
*Resonating sounds are made when a ridge is rubbed across a finely ridged surface*  
*It is most commonly associated with grasshoppers and crickets but some beetles, bugs and even spiders*  
*are known to chirp, chirrup and hiss in this way*  
*Only one species of mammal, the streaked tenrec, is known to stridulate by rubbing its quills together*

The first technique identifies specific chemicals or elements in a sample, and it can examine whole fossils rather than the tiny fragments used in previous methods, revealing pigment patterns across the whole specimen. With it, the researchers unveiled traces of specific elements in and around the tissues, bones and surrounding rock of *Confuciusornis sanctus*. These traces provide an image of the pigmentation patterns from this long-dead bird in eerie detail.

The most striking of these trace elements was copper. As Bergmann points out, copper, which can be toxic in high levels, has persisted in the fossil in significant amounts, appearing in the images as a ghostly glow in places where feathers remained. What was it doing there? Before they could answer that, the researchers had to determine what chemical form the copper took.

SSRL staff scientist Sam Webb used the second X-ray imaging technique to study the fossil of a single feather from *Gansus yumenensis*. His analysis revealed that the copper in the fossil took the same form as copper trapped by eumelanin pigment. What's more, Webb said, "When we looked outside the feather we didn't see the copper at all."

Couple that chemistry with the way the copper was distributed, and the research team was faced with a mind-boggling conclusion: They had seen actual color patterns in the fossil bird feathers. "There is a stunningly remarkable preservation of pigments," Wogelius said. The team found the same relationship between copper and pigments in samples from modern feathers and squid.

"These new techniques for teasing out evidence of pigmentation will take a lot of the guesswork out of reconstructing the appearance of extinct dinosaurs and birds," said renowned dinosaur illustrator James Gurney, author of the best-selling *Dinotopia* series.

The discovery opens a window on the biochemistry of ancient creatures, and could lead to a far greater understanding of what they ate and the chemistry of their surroundings.

"The fossils we excavate have vast potential to unlock many secrets about the original organism's life, death and subsequent events impacting its preservation," said paper co-author Phil Manning, a paleontologist at the University of Manchester. "In doing this, we unlock much more than just paleontological information. We now have a chemical roadmap to track similar pigments in all life."

[http://www.eurekalert.org/pub\\_releases/2011-06/foas-rwe063011.php](http://www.eurekalert.org/pub_releases/2011-06/foas-rwe063011.php)

### **Red wine: Exercise in a bottle?**

#### ***New research in the FASEB Journal suggests that a daily intake of resveratrol prevents the ill effects of simulated weightlessness on muscle and bone metabolism***

Bethesda, MD—As strange as it sounds, a new research study published in the *FASEB Journal* (<http://www.fasebj.org>), suggests that the "healthy" ingredient in red wine, resveratrol, may prevent the negative effects that spaceflight and sedentary lifestyles have on people. The report describes experiments in rats that simulated the weightlessness of spaceflight, during which the group fed resveratrol did not develop insulin resistance or a loss of bone mineral density, as did those who were not fed resveratrol.

According to Gerald Weissmann, M.D., Editor-in-Chief of the *FASEB Journal*, "There are overwhelming data showing that the human body needs physical activity, but for some of us, getting that activity isn't easy. A low gravity environment makes it nearly impossible for astronauts. For the earthbound, barriers to physical activity are equally challenging, whether they be disease, injury, or a desk job. Resveratrol may not be a substitute for exercise, but it could slow deterioration until someone can get moving again."

Scientists studied rats that underwent simulated weightlessness by hindlimb tail suspension and were given a daily oral load of resveratrol. The control group showed a decrease in soleus muscle mass and strength, the development of insulin resistance, and a loss of bone mineral density and resistance to breakage. The group receiving resveratrol showed none of these complications. Study results further demonstrated some of the underlying mechanisms by which resveratrol acts to prevent the wasting adaptations to disuse-induced mechanical unloading. This study also suggests that resveratrol may be able to prevent the deleterious consequences of sedentary behaviors in humans.

"If resveratrol supplements are not your cup of tea," Weissmann added, "then there's good news. You can find it naturally in red wine, making it the toast of the Milky Way."

## **Takeoffs and landings cause more precipitation near airports**

**BOULDER - Researchers have found that areas near commercial airports sometimes experience a small but measurable increase in rain and snow when aircraft take off and land under certain atmospheric conditions.**

The new study led by the National Center for Atmospheric Research (NCAR), is part of ongoing research that focuses on so-called hole punch and canal clouds that form when planes fly through certain mid-level clouds, forcing nearby air to rapidly expand and cool. This causes water droplets to freeze to ice and then turn to snow as they fall toward the ground, leaving behind odd-shaped gaps in the clouds.

The research team used satellite images and weather forecasting computer models to examine how often this type of inadvertent cloud seeding may occur within 62 miles (100 kilometers) of six commercial airports: London Heathrow, Frankfurt, Charles De Gaulle (Paris), Seattle-Tacoma, O'Hare (Chicago), and Yellowknife (Northwest Territories, Canada), as well as Byrd Station in Antarctica. They found that, depending on the airport and type of plane, the right atmospheric conditions typically exist up to 6 percent of the time, with somewhat more frequency in colder climates.

The lead author, NCAR scientist Andrew Heymsfield, says this phenomenon likely occurs at numerous other airports, especially in mid- and high-latitude areas during colder months. The key variable is whether there are cloud layers in the vicinity that contain water droplets at temperatures far below freezing, which is a common occurrence. He adds that more research is needed before scientists can determine whether the precipitation produced by this effect is significant. The inadvertent cloud seeding may increase the need to de-ice planes more often, he adds.

"It appears to be a rather widespread effect for aircraft to inadvertently cause some measureable amount of rain or snow as they fly through certain clouds," Heymsfield says. "This is not necessarily enough precipitation to affect global climate, but it is noticeable around major airports in the midlatitudes."

The researchers did not estimate the total amount of rain or snow that would result from such inadvertent cloud seeding. However, they analyzed radar readings that, in one case, indicated a snowfall rate of close to an inch an hour after several planes had passed through. The study is being published this week in the journal *Science*. Researchers from NASA Langley Research Center and the University of Wyoming, Laramie, co-authored the paper. Funding came from the National Science Foundation, which is NCAR's sponsor, and from NASA.

### **Solving a cloud mystery**

Scientists for decades have speculated about the origins of mysterious holes and canals in clouds. Heymsfield led a study last year establishing that the gaps, which sometimes look as though a giant hole punch was applied to a cloud, are caused when aircraft fly through midlevel clouds that contain supercooled droplets.

When a turboprop plane flies through such a cloud layer with temperatures about 5 degrees Fahrenheit or lower (about -15 degrees Celsius or lower), the tips of its propellers can cause the air to rapidly expand. As the air expands, it cools and causes the supercooled droplets to freeze into ice particles that evaporate the droplets and grow, falling out of the clouds as snow or rain.

Jet aircraft need colder temperatures (below about -4 to -13 degrees F, or -20 to -25 degrees C) to generate the seeding effect. Air forced to expand over the wings as the aircraft moves forward cools and freezes the cloud droplets. The effect is unrelated to the trails of condensed water vapor known as contrails made by the exhaust of jet engines.

In the new research, the study team used cloud measurements taken by the NASA CALIPSO satellite to quantify how often such conditions exist within about 62 miles of several airports located in relatively cloudy areas. They chose the 62-mile radius because that is approximately the distance it takes for a commercial aircraft to climb above about 10,000 feet, where many of the supercooled cloud layers are located.

Of the major, mid-latitude airports studied, they found that the Frankfurt, DeGaulle, and O'Hare airports most frequently experienced the right conditions for propeller aircraft to generate precipitation. In each case, the conditions existed more than 5 percent of the time over the course of a year. The researchers found that the right conditions existed more than 3 percent of the time for jets at Heathrow, Frankfurt, and Seattle-Tacoma.

Yellowknife experienced such conditions more often, about 10 percent of the time for propeller planes and 5 percent for jets, presumably because of colder cloud conditions at higher latitudes. Byrd often experienced the very cold conditions that enable jets to cause inadvertent cloud seeding.

The researchers also found that a diverse range of aircraft can induce precipitation. By comparing observations of hole-punch and canal clouds made by a National Oceanic and Atmospheric Administration (NOAA) satellite with flight path records from the Federal Aviation Administration, they confirmed that



commercial jets (such as Boeing 757s and the McDonnell Douglas MD-80 series of jets), military aircraft (B-52s), various regional and private jets, turboprops, and prop/piston planes all can induce precipitation.

"It appears that virtually any airplane that flies through clouds containing liquid water at temperatures much below freezing can cause this effect," Heymsfield says.

Satellite readings analyzed by the team showed that holes and canals generated by aircraft can occur with some frequency. For example, an extensive cloud layer over Texas on January 29, 2007, contained 92 such gaps, some of which persisted for more than four hours and reached lengths of 60 miles or more.

Heymsfield and his colleagues also used a powerful software tool, known as the Weather and Research Forecasting model, to learn more about how the holes form and develop. They found that the hole rapidly spreads about 30 to 90 minutes after an aircraft passes through. This would be the peak time for precipitation associated with the cloud-seeding effect. After about 90 minutes, ice and snow begin to dissipate.

[http://www.eurekalert.org/pub\\_releases/2011-06/uom-pdd063011.php](http://www.eurekalert.org/pub_releases/2011-06/uom-pdd063011.php)

### **Preventing diabetes damage: Zinc's effects on a kinky, two-faced cohort**

**ANN ARBOR, Mich. - In type 2 diabetes, a protein called amylin forms dense clumps that shut down insulin-producing cells, wreaking havoc on the control of blood sugar. But zinc has a knack for preventing amylin from misbehaving.**

Recent research at the University of Michigan offers new details about how zinc performs this "security guard" function. The findings appear in the July 8 issue of the Journal of Molecular Biology.

Amylin is something of a two-faced character. In healthy people who have normal levels of zinc in the insulin-producing islet cells of the pancreas, amylin actually pitches in to help with blood sugar regulation, says Ayyalusamy Ramamoorthy, a U-M professor of chemistry and of biophysics in the College of Literature, Science, and the Arts. In fact, an analog of amylin called Symlin is used in conjunction with insulin to manage blood sugar levels in diabetics.

This good behavior on amylin's part comes about because zinc acts like a security guard at a rock concert, whose job is keeping fans from turning troublesome and destructive. In molecular terms, zinc prevents amylin - also known as Islet Amyloid Polypeptide (IAPP) - from forming harmful clumps similar to those found in Alzheimer's, Parkinson's, Huntington's and various other degenerative diseases.

But in a zinc-starved cellular environment of someone with type 2 diabetes, amylin has no watchful guard to rein it in. It's free to clump together with other amylin molecules in the molecular equivalent of a gang.

The clumping ultimately leads to the formation of ribbon-like structures called fibrils, and because fibril formation has been linked to a number of human diseases, it was long assumed that fibrils themselves were toxic. But accumulating evidence now suggests that the actual culprits may be shorter snippets that assemble in the process of forming full-length fibrils. For this reason, it's important to understand the whole aggregation process, not just the structure of the final fibril.

Ramamoorthy and colleagues are trying to better understand exactly how zinc interacts with amylin, in hopes of finding ways of treating or preventing type 2 diabetes and other diseases associated with aging. In earlier work, they showed that when zinc binds to amylin, at a point near the middle of the amylin molecule, the amylin molecule kinks, which interferes with the formation of toxic clumps. In the current work, they show that the binding of zinc in the middle makes one end of the amylin molecule, called the N-terminus, become more orderly. "This is significant, because the N-terminus is very important in clump formation and amylin toxicity," Ramamoorthy said.

In addition, the researchers found that before amylin can begin forming fibrils, zinc must be roused from its nesting place. This eviction is costly in energetic terms, and the sheer expense of it discourages fibril formation. And because a single zinc molecule can bind to several amylin molecules, it ties up the amylin in assemblages that, unlike certain other aggregations, are not intermediates in the pathway that leads to fibril formation.

However zinc, like amylin, has a dual nature. At conditions similar to those outside islet cells, where even a tiny amount of amylin aggregates in the blink of an eye, zinc inhibits fibril formation. But in conditions resembling the inside of the cell, the inhibitory effect begins to wane and other factors, like insulin, take on zinc's security guard duties. Ramamoorthy's group found that this happens because amylin has not one, but two binding sites for zinc. Zinc prefers to bind at the first site - the one in the middle of the amylin molecule, where its binding discourages fibril formation. But when there's too much zinc around, all the binding sites in the middle positions are occupied and zinc must attach to amylin at the second site, which counteracts the effect of the first site. This may explain why decreased levels of insulin - the backup security guard - inside islet cells of diabetics result in islet cell death.

The experiments described in the Journal of Molecular Biology paper were all done in an artificial environment, not a living organism where zinc levels constantly fluctuate. In future experiments, Ramamoorthy

hopes to more closely approximate natural conditions in order to better understand how amylin interacts with islet cells and what triggers its toxicity toward the cells. The results of these studies will facilitate the development of metal-based therapies for type 2 diabetes, similar to the promising metal-based drugs developed for Alzheimer's and other neurodegenerative diseases, Ramamoorthy said.

*Ramamoorthy's coauthors in the paper are undergraduate student Samer Salamekh, postdoctoral fellows Jeffrey Brender and Suk-Joon Hyung, former graduate student Ravi Prakash Reddy Nanga, NMR specialist Subramanian Vivekanandan and assistant professor of chemistry Brandon Ruotolo The National Institutes of Health provided funding for the research.*

*For more information: Ayyalusamy Ramamoorthy: <http://ns.umich.edu/htdocs/public/experts/ExpDisplay.php?ExpID=1170>  
[http://www.eurekalert.org/pub\\_releases/2011-06/bmj-pt062911.php](http://www.eurekalert.org/pub_releases/2011-06/bmj-pt062911.php)*

## **'Goat plague' threat to global food security and economy must be tackled, experts warn**

### **Review: Peste des petits ruminants: A suitable candidate for eradication?**

"Goat plague," or peste des petits ruminants (PPR), is threatening global food security and poverty alleviation in the developing world, say leading veterinarians and animal health experts in this week's *Veterinary Record*. They call on the UN Food and Agricultural Organisation (FAO) and the World Organisation for Animal Health (OIE) to turn their attention now to ridding the world of the PPR virus, which carries a very high risk of death among infected animals. The call follows the formal announcement this week by the FAO that a related virus, rinderpest, better known as "cattle plague," has now been eradicated around the globe.

In an editorial, senior vets, all of whom were variously involved in the global rinderpest eradication campaign, say that getting rid of that virus has had far reaching effects. "What is not generally appreciated is that the eradication of rinderpest has yielded benefits that surpass virtually every other development programme in agriculture, and will continue to do so in future," they write. They cite the case of Chad, where between 1963 and 2002, every dollar spent on rinderpest eradication made a return of at least \$US16.

Now the world must focus on achieving the same for PPR, which is endemic in most of sub Saharan Africa "as well as a swathe of countries from Turkey through the Middle East to south Asia," they say. The virus has also recently been reported in North Africa, central Asia, and China. It's important to control the infection because it spreads quickly through goat herds and sheep flocks, decimating their numbers, and taking a terrible financial toll on the farmers and families who depend on these animals for their livelihoods, say the authors.

And it has also spread to wildlife species, many of which are endangered or threatened. "Because poorer people are more likely to keep small ruminants than cattle, women and children tend to have more access and control over them, PPR control and eradication would be both pro-poor and pro-women and children. It fits many development objectives for nutrition, food security and poverty alleviation," they write.

"We believe that a global programme for the total eradication of PPR should be established as an international undertaking without delay," they declare.

"Given support from governments, international organisations, and funding agencies, we believe that another great success could be achieved within a 10 year time frame with concerted international effort," they suggest.

In a review published in the same issue, senior international vets, including from the Institute for Animal Health in Pirbright, Surrey, document the history of the infection and explain the scientific basis for eradication of the virus. "Although PPR has not yet been seen in the UK, and is currently absent from most European countries, it is without doubt the fastest growing and potentially the most economically important disease of sheep and goats anywhere in the developing world," they write.

They go on to say that there has been a reluctance to tackle the issue because sheep and goats are considered to be of lesser economic value than cattle, and their shorter working lives mean that it would cost more to eradicate PPR. But they warn: "The ever advancing spread of PPR has made the economic impact of the disease, and consequently the benefits of its eradication, much greater. The imperative for coordinated action is therefore much stronger."

<http://www.scientificamerican.com/blog/post.cfm?id=virologist-advocates-vaccinating-bo-2011-06-30>

## **Virologist Advocates Vaccinating Only Boys for HPV to Prevent Cervical Cancer**

By Robin Lloyd | Jun 30, 2011 03:00 AM | 1

**LINDAU, Germany—A vaccine to prevent infections of cancer-causing human papilloma virus (HPV) is currently approved for use in the U.S. in boys and girls and in the U.K. in girls.**

The U.S. public health campaign focuses on vaccinating girls. The virologist who won a Nobel Prize for confirming that HPV causes cervical cancer supports educational efforts to help parents understand the importance of vaccinating girls. But he actually suggests a step further.

"I would say something a little more controversial," Harald zur Hausen said June 29 in a discussion here with two graduate students who met with him for a conversation filmed by a Nature video crew (Scientific

American is part of Nature Publishing Group). "If you only vaccinate boys, you would have a better result than if you only vaccinate girls. Boys are a little more active than girls."

He acknowledged, however, that his thinking might be a bit utopian. (Cervical cancer kills 250,000 girls and women every year worldwide, and is the second leading cause of cancer death in women.)

The conversation included Jan Gralton, who is finishing her dissertation on rhinoviruses at the University of New South Wales in Australia, and Sven-Eric Schelhorn, a bioinformaticist who works on dynamics modeling for HCV and HIV at the Max-Planck Institute for Informatics. The students were among more than 500 selected to participate in this week's Lindau Nobel Laureate Meeting, giving them the opportunity to hear lectures by and gain career tips from more than 20 Nobel prize-winners.

The hour-long conversation covered topics ranging from zur Hausen's contention that an unknown virus in beef might be causing colorectal cancer (the correlation is already supported by research in the past few decades), his research investigating further links between viruses and cancers, points of connection among all three scientists' work, informed consent and other ethical issues around vaccines, the possibility that viruses might be commensal in the same way that some bacteria are, and where the field of cancer research is headed.

<http://www.physorg.com/news/2011-06-brought-cholera-haiti.html>

### **Study suggests UN force brought cholera to Haiti**

**(AP) - Evidence "strongly suggests" that a United Nations peacekeeping mission brought a cholera strain to Haiti that has killed thousands of people, a study by a team of epidemiologists and physicians says.**

The study is the strongest argument yet that newly-arrived Nepalese peacekeepers at a base near the town of Mirebalais brought with them the cholera, which spread through the waterways of the Artibonite region and elsewhere in this impoverished Caribbean country. The disease has killed more than 5,500 people and sickened more than 363,000 others since it was discovered in October, according to the Haitian government.

"Our findings strongly suggest that contamination of the Artibonite (river) and 1 of its tributaries downstream from a military camp triggered the epidemic," said the report in the July issue of *Emerging Infectious Diseases*, a journal of the U.S. Centers for Disease Control and Prevention.

The article says there is "an exact correlation" in time and place between the arrival of a Nepalese battalion from an area of its South Asian homeland that was experiencing a cholera outbreak and the appearance of the first cases in the Meille river a few days later. The remoteness of the Meille river in central Haiti and the absence of other factors make it unlikely that the cholera strain could have come to Haiti in any other way, the report says.

In an email U.N. mission spokeswoman Sylvie Van Den Wildenberg didn't comment on the findings of the article published in the CDC journal, referring only to a study released in May by a U.N.-appointed panel.

That panel's report found that the cholera outbreak was caused by a South Asian strain imported by human activity that contaminated the Meille river where the U.N. base of the Nepalese peacekeepers is located. The study also found that bad sanitation at the camp would've made contamination of the water system possible.

But the U.N. report refrained from blaming any single group for the outbreak. While no other potential source of the bacteria itself was named, the report attributed the outbreak to a "confluence of circumstances," including a lack of water infrastructure in Haiti and Haitians' dependence on the river system.

The panel's report was ordered by U.N. Secretary-General Ban Ki-moon as anti-U.N. protests spread in Haiti and mounting circumstantial evidence pointed to the troops. Before that, for nearly two months after the outbreak last October, the United Nations, CDC and World Health Organization refused to investigate the origin of the cholera, saying that it was more important to treat patients than to try to figure out the source.

The article published in the CDC journal comes as health workers in Haiti wrestle with a spike in the number of cholera cases brought on by several weeks of rainfall. The aid group Oxfam said earlier this month that its workers were treating more than 300 new cases a day, more than three times what they saw when the disease peaked in the fall.

Cholera is caused by a bacteria that produces severe diarrhea and is contracted by eating or drinking contaminated food or water. The disease has spread to the neighboring Dominican Republic, where more than 36 deaths have been reported since November.

Epidemiologist Renaud Piarroux, the lead author of the CDC journal article, was initially sent by the French government in late 2010 to investigate the origins of Haiti's outbreak. He authored a report for U.N. and Haitian officials that said the Nepalese peacekeepers likely caused the outbreak, a copy of which was obtained at the time by the AP. The latest study was more complete and its methodology was reviewed by a group of scientists.

The new study argues it is important for scientists to determine the origin of cholera outbreaks and how they spread in order to eliminate "accidentally imported disease."

Moreover, the study says, figuring out the source of a cholera epidemic would help health workers better treat and prevent cholera by minimizing the "distrust associated with the widespread suspicions of a cover-up of a deliberate importation of cholera." It also argues that demonstrating an imported origin would compel "international organizations to reappraise their procedures."

After cholera surfaced last fall, many Haitians believed the Nepalese peacekeepers were to blame, straining relations between the population and U.N. personnel and sparking angry protests. On the streets, cholera has become slang for something that must be banished from Haiti.

The new study is acknowledged in a commentary by a pair of public health experts affiliated with the CDC. "However it occurred, there is little doubt that the organism was introduced to Haiti by a traveler from abroad, and this fact raises important public health considerations," wrote Scott Dowell, director of the CDC's Division of Global Disease Detection and Emergency Response, and Christopher Braden, a medical epidemiologist with the CDC.

<http://www.physorg.com/news/2011-06-coli-outbreak-egypt-seeds.html>

### **E. coli outbreak may be traced to Egypt seeds**

**(AP) - European food and disease prevention authorities said Wednesday they are investigating whether the E. coli outbreak in Germany and France may be traced back to fenugreek seeds imported from Egypt either in 2009 or last year.**

The European Center for Disease Prevention and Control and the European Food Safety Authority said in a joint report that "there is still much uncertainty about whether this is truly the common cause of all the infections." The report said "fenugreek seeds imported from Egypt either in 2009 and/or 2010 are implicated in both outbreaks." Fenugreek seeds are commonly used in the preparation of pickles and curry powders as well as Indian, Ethiopian and Yemeni cuisine. However, further investigation was necessary, said the report.

The death toll in Europe's E. coli outbreak has risen by three to at least 47, according to German authorities. Germany's disease control center said earlier this week that 46 deaths have now been reported in the country. One person has died in Sweden. In France, eight cases have been reported so far. Seven people have been hospitalized in the Bordeaux region and another person was released.

The report said that a 2009 lot of fenugreek seeds appeared to be implicated in the outbreak in France and a 2010 lot in the German outbreak. But it said this possible link does not explain the case in Sweden, where no consumption of sprouts has been implicated. Many questions were still unanswered about the source of the E. coli.

A further 119 cases have been reported in a total of 15 other countries. The source has been traced to a vegetable sprout farm in northern Germany. The World Health Organization said it considers an outbreak in France separate. But it also said that, of the eight French cases, three of them carried the same bacterial strains as in Germany. The report said the clinical picture of the French cases was similar to that of German cases.

<http://www.bbc.co.uk/news/technology-13973805>

### **Security researchers discover 'indestructible' botnet**

**More than four million PCs have been enrolled in a botnet security experts say is almost "indestructible".**

The botnet, known as TDL, targets Windows PCs and is difficult to detect and shut down. Code that hijacks a PC hides in places security software rarely looks and the botnet is controlled using custom-made encryption.

Security researchers said recent botnet shutdowns had made TDL's controllers harden it against investigation.

The 4.5 million PCs have become victims over the last three months following the appearance of the fourth version of the TDL virus.

The changes introduced in TDL-4 made it the "most sophisticated threat today," wrote Kaspersky Labs security researchers Sergey Golovanov and Igor Soumenkov in a detailed analysis of the virus. "The owners of TDL are essentially trying to create an 'indestructible' botnet that is protected against attacks, competitors, and anti-virus companies," wrote the researchers.

Recent successes by security companies and law enforcement against botnets have led to spam levels dropping to about 75% of all e-mail sent, shows analysis by Symantec. A botnet is a network of computers that have been infected by a virus that allows a hi-tech criminal to use them remotely. Often botnet controllers steal data from victims' PCs or use the machines to send out spam or carry out other attacks.

The TDL virus spreads via booby-trapped websites and infects a machine by exploiting unpatched vulnerabilities. The virus has been found lurking on sites offering porn and pirated movies as well as those that let people store video and image files. The virus installs itself in a system file known as the master boot record.

This holds the list of instructions to get a computer started and is a good place to hide because it is rarely scanned by standard anti-virus programs.

The biggest proportion of victims, 28%, are in the US but significant numbers are in India (7%) and the UK (5%). Smaller numbers, 3%, are found in France, Germany and Canada.

However, wrote the researchers, it is the way the botnet operates that makes it so hard to tackle and shut down. The makers of TDL-4 have cooked up their own encryption system to protect communication between those controlling the botnet. This makes it hard to do any significant analysis of traffic between hijacked PCs and the botnet's controllers. In addition, TDL-4 sends out instructions to infected machines using a public peer-to-peer network rather than centralised command systems. This foils analysis because it removes the need for command servers that regularly communicate with infected machines.

"For all intents and purposes, [TDL-4] is very tough to remove," said Joe Stewart, director of malware research at Dell SecureWorks to Computerworld. "It's definitely one of the most sophisticated botnets out there."

However, the sophistication of TDL-4 might aid in its downfall, said the Kaspersky researchers who found bugs in the complex code. This let them pry on databases logging how many infections TDL-4 had racked up and was aiding their investigation into its creators.

<http://www.newscientist.com/article/dn20630-zoologger-the-first-nonhuman-meat-farmers.html>

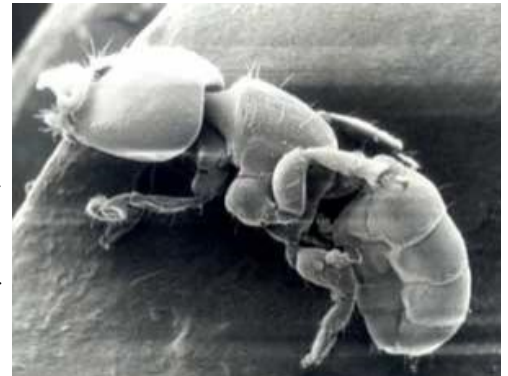
### **Zoologger: The first non-human meat farmers**

***Species: Melissotarsus insularis and three other Melissotarsus species***

***Habitat: Down on the farm under the bark of African trees, particularly in Madagascar.***

Lots of ants practise a rudimentary form of agriculture. Some are gardeners, gathering leaf fragments on which they cultivate a crop of tasty fungus. Others are dairymaids, "milking" the sweet excretion known as honeydew from aphids, scale insects and other related insects.

But the *Melissotarsus* ants of continental Africa and Madagascar are special. If biologists' best guess proves correct, these ants raise their insect herds for meat, not milk – the first example of meat farmers other than humans. And that's not all. The insects they cultivate may be the best example of true domestication outside of our crop plants.



***Insects herded by this critter beware, your boss may be feeling hungry (Image: California Academy of Sciences)***

You have to know what you're looking for to even see *Melissotarsus*. The ants – barely 3 millimetres long – live most of their lives within the intricate gallery systems they excavate in and under the bark of trees. They're such committed burrowers that their second pair of legs points up, not down, so they can get a foothold in the tunnel roof as well as the floor. They share their galleries with several species of armoured scale insects, so-called because most species secrete a tough, waxy scale that covers and protects them.

But the ants' charges aren't paying for their keep in the usual way, with honeydew. In fact, they apparently lack a complete gut and thus are incapable of making the stuff. Nor are the ants nibbling at the waxy scale – the scale insects tended by the ants, despite their name, have no scale, and some even lack the wax glands needed to produce it. "Armoured scales just don't seem to be equipped to produce an exudate that's enough to satisfy an ant," says Scott Schneider, an entomologist at the University of Massachusetts at Amherst.

Savour the flavour

So what do the ants get from all their work housing and protecting the scale insects? Almost the only remaining possibility is that the ants sometimes make a meal of the insects themselves, Schneider reported at a recent meeting of the Society for the Study of Evolution in Norman, Oklahoma. No one has yet caught *Melissotarsus* in mid-munch, partly because the ants like their privacy and quickly seal off any peepholes into their galleries. Next year, however, Schneider will measure stable isotopes in the ants' bodies, which will indicate whether their diet is mostly plant or animal in origin.

If the ants are indeed eating the scale insects, they may have selected livestock that lack the hard, inedible scale because it makes them easy to eat. In paralleling what humans have done in breeding their crop plants – corn, for example, is much less armoured than its ancestor, teosinte – the ants may have created the clearest case of domestication ever seen in non-human animals, says Schneider.

<http://medicalxpress.com/news/2011-06-nervous-stem-cells-variety-cell.html>

## **Nervous system stem cells can replace themselves, give rise to variety of cell types, even amplify**

**(Medical Xpress) - A Johns Hopkins team has discovered in young adult mice that a lone brain stem cell is capable not only of replacing itself and giving rise to specialized neurons and glia – important types of brain cells – but also of taking a wholly unexpected path: generating two new brain stem cells.**

A report on their study appears June 24 in Cell.

Although it was known that the brain has the capacity to generate both neurons, which send and receive signals, and the glial cells that surround them, it was unclear whether these various cell types came from a single source. In addition to demonstrating that a single radial glia-like (RGL) brain cell is able to generate two very different functional cell types, the Hopkins researchers, by following the fates of single cells over time, found that a single brain stem cell can even produce two stem cells like itself.

“Now we know they don’t just maintain their numbers, or go down in number, but that stem cells can amplify,” says Hongjun Song, Ph.D., professor of neurology and neuroscience and director of the Stem Cell Program in the Institute for Cell Engineering, the Johns Hopkins University School of Medicine. “If we can somehow cash in on this newly discovered property of stem cells in the brain, and find ways to intervene so they divide more, then we might actually increase their numbers instead of losing them over time, which is what normally happens, perhaps due to aging or diseases.”

The researchers’ findings hinged on a decision to single out and follow lone, radial glia-like cells, instead of labeling and monitoring entire stem cell populations in the mouse brain. They took this approach because they suspected radial glia-like cells were essentially stem cells, having been shown in previous studies to give rise to neurons. Using mice genetically modified with special genes that color-code cells for easy labeling and tracking, the Hopkins team injected a very small amount of a chemical into about 50 mouse brains to induce extremely limited cell labeling.

“It’s a simple idea that forced us to confront a lot of complex technical issues,” Song says. “With so many millions of cells in the relatively large mouse brain, labeling a single stem cell and then chasing its family history was like finding a needle in a haystack.”

The scientists developed computer programs and devised a new imaging technique that allowed them to examine stained slices of the mouse brain and, ultimately, follow single, randomly chosen radial glia-like stem cells over time. The method allowed them to track down all the new cells derived from a single original stem cell. “We reconstituted single stem cells’ family trees to look at the progeny they gave rise to,” says Guo-li Ming, associate professor of neurology and neuroscience and a member of the Neuroregeneration Program in the Institute for Cell Engineering. “We discovered that single cells in an intact animal nervous system absolutely do exhibit stem-cell properties; they are capable of both replicating themselves and producing different types of differentiated neural progeny.”

The team followed the fates of all the marked radial glia-like stem cells for at least a month or two, and examined some a full year later to discover that even over the long term, the “mother” cell was still generating itself as well as different kinds of progeny.

In addition, the researchers investigated how these RGLs were activated on a molecular level, focusing, in particular, on the regulatory role of an autism-associated gene called PTEN. Conventional wisdom was that deleting this gene led to an increase in stem-cell activation. However, the scientists demonstrated that was a transient effect in the mouse brains, and that, ultimately, PTEN deletion leads to stem-cell depletion.

<http://www.newscientist.com/article/dn20638-beetles-beat-us-to-the-screw-and-nut.html>

### **Beetles beat us to the screw and nut**

**\* 19:00 30 June 2011 by Michael Marshall**

***Weevils are screwed up. Their legs are, anyway. The beetles are the first animals found to have a screw-and-nut mechanism in their bodies.***

Alexander Riedel of the State Museum of Natural History in Karlsruhe, Germany, and colleagues were studying a genus of weevils called *Trigonopterus*. Found in New Guinea and neighbouring islands, it probably contains over 1000 species, most of them undiscovered.

*The versatile weevil has screwy legs (Image: Alex Riedel/The State Museum of Natural History)*



Poring over CT scans of the Papua New Guinea species *Trigonopterus oblongus*, Riedel was surprised to find that its legs appeared to be screwed into its body. The top segment of each leg, the femur, is attached to a small part called the trochanter. In turn, the trochanter attaches the leg to the insect's body, by screwing into a part called the coxa, which is similar to a hip.

Inside the coxa and on the outer surface of the trochanter, Riedel found ridges just like those on screws and nuts. The beetles could twist their front legs through 90 degrees and their middle and hind legs through 130 degrees.

### Flexible weevils

Wondering if the design was unique to *T. oblongus*, Riedel looked at 15 other weevil species from different families. They all had the same screw-and-nut mechanism. "It's a safe bet that all weevils have it," he says.

The ability to twist its legs in their sockets might be particularly handy for weevils like *T. oblongus*, which lives on leaves and twigs and consequently has to splay its legs to find footholds. Not all weevils live like this, but the earliest ones probably did, explaining why the mechanism is ubiquitous in modern weevils.

It looks like the beetles are using the screw-and-nut mechanism in the opposite way to humans, says Chris Lyal of the Natural History Museum in London. Humans turn a screw to make it move along its length, but the weevil's muscles pull along the length of its leg to make it turn.

*The trochanter, which the leg is attached to, showing external spiral thread (Image: Science/AAAS)*

The weevils are another example of evolution coming up with the same solutions to problems as human engineers. Bacteria had continuously rotating wheels long before we did, in the form of spinning "tails" called flagella. It seems the weevils beat us to threaded screws and nuts. "Insects are fabulous," Lyal notes.

*Journal reference: Science, vol 333, p 52*

<http://www.bbc.co.uk/news/science-environment-13946941>

### 'Gas-less' kangaroo secret sniffed out

**Richard Black** By Richard Black Environment correspondent, BBC News

***Scientists have gone some way to explaining why kangaroos produce much less methane in their burps, flatus and manure than farm animals such as cows.***

They identified a bacterium in the gut of the Tammar wallaby - a member of the kangaroo family - that processes their food without making methane. Farm animals are a major source of methane, an important greenhouse gas. Writing in the journal *Science*, they suggest the work could show how to cut greenhouse emissions from livestock.

The Tammar wallaby is a fairly small member of the family, found in pockets of Western Australia and on some islands off the coast, and has long been a favourite of biological researchers. Previous work showed they produce about one-fifth as much methane as cows for each unit of food they ingest; the new research is helping to show why that is.

"The guts of wallabies and cattle have evolved to support the establishment of a complex mixture of microbes, for the 'pre-digestion' of plant materials before the food is exposed to the animal's own digestive processes," said project leader Mark Morrison, of Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO).

"There are differences between the animals in terms of gut anatomy and shape that we think are also an important influence on methane production, as well as the way and the speed at which plant material moves through this 'pre-digestion' step. "But our knowledge of that microbiology has been pretty limited until now."

Identifying the bacterium - a previously unknown member of the *Succinivibrionaceae* family - was not a straightforward task, requiring a technique known as "reverse metagenomics".

Using information already available about some aspects of the bacterium's traits and the genes driving those traits, such as the ways it processes nitrogen, they were able to design a culture for growing it that would resemble conditions in the wallaby's gut.

### Cultured approach

By experimenting with different ingredients of the culture, eventually the bacterium grew well and the researchers were able to show that the main byproduct of fermentation was not methane, but succinate - a compound of carbon, hydrogen and oxygen. As well as producing far less methane, processing food this way is more efficient, with more of the available nutrition being extracted from the plants.



Members of the Succinivibrionaceae family are found in many other plant-eating animals, including cattle, though they do not appear to dominate food processing as they do in the wallabies.

The researchers hope to understand what these bacteria are doing inside farm animals, and then find ways of making them more effective. "Our long-term goal is to redirect feed digestion in livestock away from methane formation, and instead produce more end products that are nutritious for the animal," said Professor Morrison. "By doing so, we should have a positive impact both on animal productivity and the environment."

The research project was headed from national research agency CSIRO, with contributions from scientists in the US, Norway and Germany. The CSIRO is in the vanguard of global research efforts to bring down methane emissions from livestock, by methods including changing their diet and selective breeding.

Methane from farm animals accounts for a few percent of global greenhouse gas emissions, and global production of meat and milk is forecast to double over the next half-century.

[http://www.eurekalert.org/pub\\_releases/2011-07/s-eos070111.php](http://www.eurekalert.org/pub_releases/2011-07/s-eos070111.php)

### **Evolution of sport performances follows a physiological law**

#### ***Study suggests performance peaks from 20 to 30 years of age, then declines irreversibly***

Geoffroy Berthelot and Stephane Len, both researchers at the IRMES (Institut de Recherche bioMédicale et d'Epidémiologie du Sport at INSEP, Paris, France), have published their findings in *Age*, the official journal of the American Aging Association, describing the evolution of performances in elite athletes and chess grandmasters. This article is congruous with the epidemiological approaches developed by the laboratory, and suggests that changes in individual performance are linked to physiological laws structuring the living world.

Physiological parameters that characterize human capabilities (mobility, reproduction or the capacity to perform tasks) evolve throughout the life cycle. The physical and intellectual abilities follow the same pattern, starting at the moment of conception: The performance of each individual is limited at birth, then increases to a peak before declining until death. With these findings, Geoffroy Berthelot and Stephane Len modeled the careers of more than 2,000 athletes (from a panel of 25 Olympic disciplines) and grandmasters of chess. They demonstrate a simple relation between changes in performance and the age of individuals.

The results of this study validate a model previously published by Moore: The evolution of the performances of an individual throughout his life follows an exponential growth curve to a peak before declining irreversibly, following another negative exponential curve. This peak is reached at the age of 26.1 years for the disciplines studied: athletics (26.0 years), swimming (21.0 years) and chess (31.4 years). For each data set, the evolution curve is representative of a range of 91.7% of the variance at the individual level and 98.5% of the variance in terms of sport events. Moreover, these cycles are observable in other physiological parameters such as the development of lung function or cognitive skills, but also at the level of cells, organisms and populations, reflecting the fractal properties of such a law.

This study suggests that technical change, energy consumption and development strongly influenced the performance of individuals. These have increased significantly over the last century compared to today's values. Ultimately, the modeling of changes in performance with age can be extended to all individuals and lead to an estimate of life expectancy. Further research will refine these descriptive models and apply them to other areas of human activity (scientific, economic, ecological ...), and test their viability, which may help to assess the relationships of man to his environment.

*Reference Berthelot G and Len S et al (2011). Exponential growth combined with exponential decline explains lifetime performance evolution in individual and human species. Age; DOI 10.1007/s11357-011-9274-9*

[http://www.eurekalert.org/pub\\_releases/2011-07/uoz-gbh063011.php](http://www.eurekalert.org/pub_releases/2011-07/uoz-gbh063011.php)

### **Gastric bacterium *Helicobacter pylori* protects against asthma**

#### ***Infection with the gastric bacterium *Helicobacter pylori* provides reliable protection against allergy-induced asthma***

Infection with the gastric bacterium *Helicobacter pylori* provides reliable protection against allergy-induced asthma, immunologists from the University of Zurich have demonstrated in an animal model together with allergy specialists from the University Medical Center of the Johannes Gutenberg University Mainz. Their results published in the prestigious *Journal of Clinical Investigation* confirm the hypothesis recently put forward that the dramatic increase in allergic diseases in industrial societies is linked to the rapid disappearance of specific micro-organisms that populate the human body.

Allergy-induced asthma has been on the increase in the industrialized world for decades and has virtually taken on epidemic proportions. The rapid rise in allergic airway disease is attributed to air pollution, smoking, the hygiene hypothesis and the widespread use of antibiotics. The hygiene hypothesis states that modern hygiene measures have led to a lack of exposure to infectious agents, which is important for the normal maturation of the immune system. In an article published in the *Journal of Clinical Investigation*, scientists from



the University of Zurich and the University Medical Center of the Johannes Gutenberg University Mainz now reveal that the increase in asthma could be put down to the specific disappearance of the gastric bacterium *Helicobacter pylori* (*H. pylori*) from Western societies.

*H. pylori* is resistant to gastric acid. According to estimates, around half of the world's population might be infected with the bacteria. The affliction often has no symptoms, but under certain conditions can cause gastritis, gastric and duodenal ulcers, and stomach cancer. Consequently, *H. pylori* is often killed off with antibiotics as a precaution, even if the patient does not have any complaints.

### **Early infection with *H. pylori* protects against asthma**

For their study, the researchers infected mice with *H. pylori* bacteria. If the mice were infected at the age of a few days old, they developed immunological tolerance to the bacterium and even reacted insignificantly – if at all – to strong, asthma-inducing allergens. Mice that were not infected with *H. pylori* until they had reached adulthood, however, had a much weaker defense. "Early infection impairs the maturation of the dendritic cells and triggers the accumulation of regulatory T-cells that are crucial for the suppression of asthma," says Anne Müller, a professor of molecular cancer research at the University of Zurich, explaining the protective mechanism.

If regulatory T-cells were transferred from infected to uninfected mice, they too enjoyed effective protection against allergy-induced asthma. However, mice that had been infected early also lost their resistance to asthma-inducing allergens if *H. pylori* was killed off in them with the aid of antibiotics after the sensitization phase. According to lung and allergy specialist Christian Taube, a senior physician at III. Medical Clinic of the Johannes Gutenberg University Mainz, the new results confirm the hypothesis that the increase in allergic asthma in industrial nations is linked to the widespread use of antibiotics and the subsequent disappearance of micro-organisms that permanently populate the human body: "The study of these fundamental mechanisms is extremely important for us to understand asthma and be able to develop preventative and therapeutic strategies later on."

[http://www.sciencenews.org/view/generic/id/331955/title/Alzheimers\\_plaques\\_due\\_to\\_purging\\_flaw](http://www.sciencenews.org/view/generic/id/331955/title/Alzheimers_plaques_due_to_purging_flaw)

## **Alzheimer's plaques due to purging flaw**

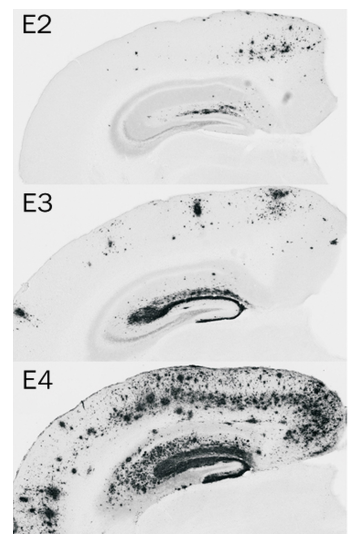
### **Disease-related gene controls clearance of plaque protein**

By Tina Hesman Saey

The high-risk version of a gene associated with Alzheimer's disease hinders the brain's ability to clear out a troublesome protein, a new study finds.

Researchers have known that people who carry the e4 version of the gene APOE are at higher risk for Alzheimer's disease and more likely to have cell-killing plaques in their brains than people who have the e3 or e2 versions. But it hasn't been clear whether people with the e4 version made more of the plaque protein — called amyloid-beta — or if the stuff just stuck around in their brains longer.

Now researchers led by David Holtzman of the Washington University School of Medicine in St. Louis have directly measured levels of amyloid-beta in the brain fluid of mice. The measurements, reported in the June 29 *Science Translational Medicine*, show that mice with the e4 version of APOE make amyloid-beta at the same rate and in the same amount as mice with different versions of the gene, but don't clear the protein out of their brains as efficiently.



**PLAQUE ATTACK** *How much plaque builds up in the brains of mice genetically engineered to get Alzheimer's disease depends upon which version of the cholesterol-handling APOE protein the animals have. The APOE e4 version is a risk factor for Alzheimer's disease in people and inhibits clearance of the plaque-forming protein from mice's brains.* Image courtesy of Joseph M. Castellano, David M. Holtzman

The study will probably draw more attention to the role amyloid-beta clearance plays in Alzheimer's disease, says Caleb Finch, a neurobiologist and codirector of the Alzheimer Disease Research Center at the University of Southern California. "I think this is a valuable contribution," he says.

It is not yet clear how different forms of the protein made by APOE govern clearance of amyloid-beta from the brain, says Joseph Castellano, a neuroscientist working in Holtzman's lab. "We don't understand that at all," he says.

The researchers would like to know if the APOE protein and amyloid-beta interact directly or if there are middlemen involved. Figuring out the connection could lead to preventive therapies that would stop the buildup of amyloid-beta.

<http://www.physorg.com/news/2011-07-nasa-prospect-mars.html>

## **NASA research offers new prospect of water on Mars**

**(PhysOrg.com) - NASA scientists are seeing new evidence that suggests traces of water on Mars are under a thin varnish of iron oxide, or rust, similar to conditions found on desert rocks in California's Mojave Desert.**

Mars could be spotted with many more patches of carbonates than originally suspected. Carbonates are minerals that form readily in large bodies of water and can point to a planet's wet history. The findings appear in the Friday July 1, online edition of the International Journal of Astrobiology.

Although only a few small outcrops of carbonates have been detected on Mars, scientists believe many more examples are blocked from view by the rust. The plausibility of life on Mars depends on whether liquid water dotted its landscape for thousands or millions of years," said Janice Bishop, a planetary scientist at NASA's Ames Research Center at the SETI Institute at Moffett Field, Calif., and the paper's lead author. "It's possible that an important clue, the presence of carbonates, has largely escaped the notice of investigators trying to learn if liquid water once pooled on the Red Planet."

Scientists conduct field experiments in desert regions because the extremely dry conditions are similar to Mars. Researchers realized the importance of the varnish earlier this year when Bishop and Chris McKay, a planetary scientist at Ames investigated carbonate rocks coated with iron oxides collected in a location called Little Red Hill in the Mojave Desert.

"When we examined the carbonate rocks in the lab, it became evident that an iron oxide skin may be hindering the search for clues to the Red Planet's hydrological history," McKay said. "We found that the varnish both altered and partially masked the spectral signature of the carbonates."

McKay also found dehydration-resistant blue-green algae under the rock varnish. Scientists believe the varnish may have extended temporarily the time that Mars was habitable, as the planet's surface slowly dried up.

"The organisms in the Mojave Desert are protected from deadly ultraviolet light by the iron oxide coating," McKay said. "This survival mechanism might have played a role if Mars once had life on the surface."

In addition to being used to help characterize Mars' water history, carbonate rocks also could be a good place to look for the signatures of early life on the Red Planet. Every mineral is made up of atoms that vibrate at specific frequencies to produce a unique fingerprint that allows scientists to accurately identify its composition.

Research data were similar to observations provided by NASA's Mars Reconnaissance Orbiter (MRO) spacecraft, as it orbited an ancient region of Mars called Nili Fossae. The area revealed the strongest carbonate signature ever found. Although MRO recently detected small patches of carbonates, approximately 200-500 feet wide, on the Martian surface, the Mojave study suggests more patches may have been overlooked because their spectral signature could have been changed by the pervasive varnish.

"To better determine the extent of carbonate deposits on Mars, and by inference the ancient abundance of liquid water, we need to investigate the spectral properties of carbonates mixed with other minerals," Bishop said.

The varnish is so widespread that NASA's Mars Exploration Rovers, Spirit and Opportunity, used a motorized grinding tool to remove the rust-like overcoat on rocks before other instruments could inspect them. In 2010, scientists using data collected by Spirit also identified a small carbonate outcrop at a crater called Gusev. NASA's newest and most capable rover, the Mars Science Laboratory Curiosity is schedule to launch in November. It will use tools to study whether the Mars had environmental conditions favorable for supporting microbial life and favorable for preserving clues about whether life existed. *Provided by JPL/NASA*

<http://www.scientificamerican.com/podcast/episode.cfm?id=hot-baths-may-cure-loneliness-11-07-02>

## **Hot Baths May Cure Loneliness**

**Recent research finds that taking a hot bath can cure loneliness. Christie Nicholson reports**

Take a hot bath, you'll feel better. Not only does warm water soothe us, it can combat loneliness. According to research published in the journal *Emotion*.

Scientists analyzed the bathing habits of 51 people. And had them record how they felt before and after bathing. The researchers found that higher scores on a measure of chronic loneliness were associated with an increase in warmer baths or showers. In a separate study, to test the link between physical temperature and emotional state, scientists had subjects hold cold and hot packs and recorded levels of perceived loneliness. They confirmed the correlation between cold packs and high loneliness scores.

Then in another study the researchers had subjects recall a time when they were feeling excluded. This exercise made the subjects subsequently desire comforting social activities like hanging with friends. But this desire was reduced for those subjects who were asked to hold a warm pack.

The authors claim this association between warmth and security is innate, yet many are not aware of the link, at least when it comes to warm baths. In another study they found that subjects do not think of a frequent bather as a particularly lonely person. A little obsessive maybe, but not lonely.

<http://www.physorg.com/news/2011-07-mobile-dont-cancer.html>

### **Mobile phones 'don't cause cancer': yet another study**

#### ***The number of brain tumours is unchanged 29 years after the introduction of mobile phones***

Scientific evidence goes increasingly against the theory that mobile phones cause cancer, a new study has concluded. The review carried out for the Institute of Cancer Research found "no convincing evidence of a link" between the technology and brain tumours. The panel, set up by the International Commission on Non-Ionizing Radiation Protection, admitted however that the possibility of small or long-term repercussions could not be ruled out. Their conclusions follow a wide-ranging study - the largest of its kind to date - which claimed that radiation associated with mobile handsets potentially increases the risk of glioma, a malignant form of the disease. While the panel accepted the Interphone study findings were "comprehensive", they identified some problems with the study's design which made it difficult to draw definite conclusions.

The results, in conjunction with those revealed by a series of similar studies, showed no increases in brain tumours up to 20 years after the introduction of mobile phones, and a decade after their use became widespread.

Extensive research also failed to establish any biological explanation for how handsets could possibly cause cancer in humans while animals exposed to radiation appeared unaffected, they said.

However the group, led by the ICR's Professor Anthony Swerdlow, said uncertainty was bound to remain for years because research could not prove the complete absence of harmful side-effects. "The results of Interphone and other epidemiological, biological and animal studies, and brain tumour incidence trends, suggest that within 10 to 15 years after first use of mobile phones, there is unlikely to be a material increase in the risk of brain tumours in adults," Swerdlow said. "However, the possibility of a small or a longer term effect cannot be ruled out." Examination of cancer rates during the next few years is expected to clarify the situation.

"If there are no apparent effects on trends in the next few years, after almost universal exposure to mobile phones in Western countries, it will become increasingly implausible that there is a material causal effect," he added. "Conversely, if there are unexplained rising trends, there will be a case to answer."

David Spiegelhalter, Winton Professor of the public understanding of risk at the University of Cambridge, said: "This report is clear that any risk appears to be so small that it is very hard to detect - even in the masses of people now using mobile phones."

David Coggon, professor of occupational and environmental medicine at the University of Southampton, said the review was "carefully considered" and its conclusions "justified". "Continued research is needed in case there are harmful effects in the longer term," he added, "but the news so far is good." (c) 2011 AFP

<http://www.physorg.com/news/2011-07-killer-horse-virus-australia.html>

### **Killer horse virus spreads in Australia**

#### ***Australian officials were on Saturday working to isolate potential victims after uncovering two more cases of the deadly horse-borne Hendra virus, which has erupted in a second state.***

Spread to humans from horses, Hendra can lead to fatal respiratory illness and has killed four of the seven people who have contracted it in Australia since it was first documented in 1994. A fresh outbreak was detected in northern Queensland state in June, with nine people undergoing tests after exposure to a sick animal.

Queensland authorities said they had discovered a second case, about 70 kilometres (40 miles) from the first farm, which had forced two horses to be put down. The outbreaks were not believed to be linked.

"Test results overnight have confirmed this as a case of Hendra virus infection," Biosecurity Queensland said. "There are eight other horses on the property that are being monitored closely." Officials said as many as six people may have been exposed to the infected animal. A third case had also been identified in neighbouring New South Wales state, according to biosecurity officials there, who stressed it was unlikely to be linked to the Queensland outbreaks. It is only the second time Hendra has been found in New South Wales.

"The horse had been in a paddock containing a fig tree, so it is likely that flying foxes were the source of infection," state health director Jeremy McAnulty said. Nine people exposed to the sick horse were being tested for the killer virus, but McAnulty said they were at low to medium risk. "All of the human infections that have occurred in the past have been linked to high level exposures to infected horses," he said.

Named after the Brisbane suburb in which it was first documented and believed unique to Australia, Hendra is believed to be carried by fruit bats (flying foxes) and spread via their urine and droppings.

The bats, which have no symptoms of disease, then pass the infection to horses, possibly via half-chewed fruit or other water or food they contaminate, and these animals then transmit it to humans.

Around 50 horses have died, or had to be put down, in 15 outbreaks of the virus since 1994. (c) 2011 AFP

## **Sea Holds Treasure Trove of Rare-Earth Elements**

### ***Survey reveals wealth of important metals in ocean floor mud.***

**By Nicola Jones of Nature Magazine**

The world's insatiable demand for the rare-earth elements essential for electric cars, flat-screen TVs, iPods, superconducting magnets, lasers, missiles, night-vision goggles, wind turbines and many other advanced products could one day be partially met by sea-floor mining, hints an assessment of the Pacific Ocean's resources. But accessing the treasure trove of key elements on the ocean floor will be very expensive and potentially harmful to sea-floor ecology.

The rare-earth elements -- metals such as lanthanum and neodymium -- are used to make strong magnets, which help to drive the motors in everything from laptops to electric cars and washing machines. Demand for rare earths has leapt from 30,000 tonnes in the 1980s to about 120,000 tonnes in 2010 -- higher than the world's current annual production of about 112,000 tonnes. Despite the name, rare earths aren't geologically scarce. The problem, though, is that land deposits of them are thin and scattered around, so sites which are commercially exploitable or not subject to tough environment restrictions are few. As a result, the 17 elements have sometimes been dubbed "21st-century gold" for their rarity and value. But China, which accounts for 97 percent of the world's production of 17 rare-earth elements, has put stringent caps on the amount available for export. This has led to big price jumps and the depletion of national stockpiles elsewhere in recent years. New mines are now being developed around the world, for example in California, Canada, and Australia.

#### **Wet wealth**

It has long been known that the ocean might provide a wealth of rare earths. Sea-floor hydrothermal vents pump out rare-earth elements dissolved in their hot fluids. And these elements and others accumulate in potato-sized lumps, called manganese nodules, on the sea floor. The elements also build up in sea-floor mud; but only a few spot measures of this source of rare-earth elements have previously been made. The material had taken hundreds of millions of years to accumulate, depositing at the rate of less than half a centimetre (0.2 of an inch) per thousand years. They were probably snared by action with a hydrothermal mineral called phillipsite.

Kato and his colleagues set out to perform a widespread assessment of this possible resource. They looked at 2,000 samples of sediments taken from 78 sites covering a major portion of the centre-eastern Pacific between 120 and 180 degrees longitude, and found rare-earth concentrations as high as 0.2% of the mud in the eastern South Pacific, and 0.1% near Hawaii. That might not sound like much, but those concentrations are as high as or higher than those at one clay mine currently in operation in China, they point out. And the deposits are particularly rich in heavy rare-earth elements -- the rarer and more expensive metals.

Some of the deposits are more than 70 metres thick. The authors estimate that an area of 1 square kilometre around a hotspot near Hawaii could hold 25,000 tonnes of rare earths. Overall, they say, the ocean floor might hold more than the 110 million tonnes of rare earths estimated to be buried on land. A bigger question is whether the technology exists for recovering the mud at such great depths -- 4,000 to 5,000 metres (13,000 to 16,250 feet) -- and, if so, whether this would be commercially viable. Lab tests show the deposits can be simply removed by rinsing the mud with diluted acids, a process that takes only a couple of hours and, say the authors, would not have any environmental impact so long as the acids are not dumped in the ocean.

#### **Money makers**

In an email exchange with AFP, lead author Yasuhiro Kato, a professor of economic geology and geochemistry at the University of Tokyo, said the response from mining companies was as yet unknown, "because nobody knows the presence of the (rare-earth) -rich mud that we have discovered." "I am not an engineer, just a geoscientist," Kato said. "But about 30 years ago, a German mining company succeeded in recovering deep-sea mud from the Red Sea. So I believe positively that our deep-sea mud is technologically developable as a mineral resource."

But Gareth Hatch, an industry analyst and founder of the Technology Metals Research consultancy in Carpentersville, Illinois, is sceptical. "People talk about mining on the asteroids or the Moon. This isn't that hard, but it's similar," says Hatch. Current on-land mines, and sites picked out for future mines, have rare-earth concentrations of about 3-10%, he points out. The much lower concentrations at the Chinese clay mine mentioned by Kato and his colleagues are only economically viable because the material is much easier to access than it would be in hard rock. That's not true for mud located below 4 or 5 kilometres of water, which would require expensive ship time and equipment to pull up. "There are better options," he says.

Craig Smith, an oceanographer at the University of Hawaii at Manoa, notes that companies are exploring the idea of mining manganese nodules from the sea floor to exploit their commercially-valuable contents, including

copper and nickel as well as rare earths. Commercial mining of nodules is "probably a decade away", says Smith. Ocean mud could prove another possible source of the increasingly valuable elements.

Smith and others have raised concerns about the environmental consequences of deep-sea mining, particularly around hydrothermal vents, which host unique worms, clams and other life. Kato points out that gathering the metals from mud won't involve disturbing the vents; he found the highest concentrations of rare-earth elements thousands of kilometres away from vents. Closer than that, the rare earths were diluted by other deposits. But Smith notes that sea-floor life away from vents could also be fragile. Ecosystems on the cold ocean floor regenerate very slowly, he says, so any damage done by mining could take decades or centuries to heal.

<http://www.bbc.co.uk/news/health-13992232>

### **IVF procedure 'may increase risk of Down's syndrome'**

**By Michelle Roberts Health reporter, BBC News, in Stockholm**

#### ***Drugs used in IVF for older women may increase their risk of having a baby with Down's syndrome, experts say.***

Doctors already know that the chance of having a baby with the genetic condition goes up with the age of the mother, especially for those over 35.

Now UK researchers, who looked at 34 couples, think drugs used to kick-start ovaries for IVF in older women disturb the genetic material of the eggs. Work is now needed to confirm their suspicions, a meeting in Sweden heard. And they do not yet know the magnitude of risk, but say it could also cause many other genetic conditions, not just Down's. The findings, presented at the European Society of Human Reproduction and Embryology's annual conference, come from a UK study of 34 couples undergoing fertility treatment.

All of the women in the group were older than 31 and had been given drugs to make their ovaries release eggs ready for their IVF treatment. When the researchers studied these now fertilised eggs they found some had genetic errors.

These errors could either cause the pregnancy to fail or mean the baby would be born with a genetic disease.

A closer look at 100 of the faulty eggs revealed that many of the errors involved a duplication of coiled genetic material, known as a chromosome. Often, the error resulted in an extra copy of chromosome 21, which causes Down's syndrome. But unlike "classic" Down's syndrome which is often seen in the babies of older women who conceive naturally, the pattern of genetic errors leading to Down's in the IVF eggs was different and more complex. And this led the researchers to believe that it was the fertility treatment that was to blame.

<b><i>Down's syndrome risk with the mother's age:</i></b>
* 20 years - 1 in 1,500
* 25 years - 1 in 1,300
* 35 years - 1 in 350
* 40 years - 1 in 100
* 45 years - 1 in 30

Lead researcher Professor Alan Handyside, director of the London Bridge Fertility, Gynaecology and Genetics Centre, said more research was now needed. "This could mean that the stimulation of the ovaries is causing some of these errors. We already know that these fertility drugs can have a similar effect in laboratory studies. But we need more work to confirm our findings." If more tests back up their suspicions then it would mean that doctors should be more cautious about using these treatments, he said.

The researchers believe their work could also help identify which women might be better off using donor eggs for IVF instead.

Co-investigator Professor Joep Geraedts, of Bonn University in Germany, said: "This in itself is already a big step forward that will aid couples hoping for a healthy pregnancy and birth to be able to achieve one."

UK fertility expert Mr Stuart Lavery said: "There's a huge increase in the number of women undergoing IVF at later ages as people delay the age of starting a family.

"Previously we have always thought that these chromosomal abnormalities were related to the age of the egg.

"What this work shows is that a lot of the chromosomal abnormalities are not those that are conventionally age-related. It raises the concern that some of the abnormalities might be treatment-related.

"It's a little unclear as to whether it's the medication itself that is affecting the egg quality or whether it's the medication that is just forcing the issue and allowing eggs that nature's quality control system would have otherwise excluded, to arise."