http://www.eurekalert.org/pub_releases/2012-05/whoi-ccl052312.php

Climate change led to collapse of ancient Indus civilization, study finds

A new study provides evidence that climate change was a key ingredient in the collapse of the great Indus or Harappan Civilization.

A new study combining the latest archaeological evidence with state-of-the-art geoscience technologies provides evidence that climate change was a key ingredient in the collapse of the great Indus or Harappan Civilization almost 4000 years ago. The study also resolves a long-standing debate over the source and fate of the Sarasvati, the sacred river of Hindu mythology.

Once extending more than 1 million square kilometers across the plains of the Indus River from the Arabian Sea to the Ganges, over what is now Pakistan, northwest India and eastern Afghanistan, the Indus civilization was the largest—but least known—of the first great urban cultures that also included Egypt and Mesopotamia. Like their contemporaries, the Harappans, named for one of their largest cities, lived next to rivers owing their livelihoods to the fertility of annually watered lands.

"We reconstructed the dynamic landscape of the plain where the Indus civilization developed 5200 years ago, built its cities, and slowly disintegrated between 3900 and 3000 years ago," said Liviu Giosan, a geologist with Woods Hole Oceanographic Institution (WHOI) and lead author of the study published the week of May 28 in the Proceedings of the National Academy of Sciences. "Until now, speculations abounded about the links between this mysterious ancient culture and its life-giving mighty rivers."

Today, numerous remains of the Harappan settlements are located in a vast desert region far from any flowing river. In contrast to Egypt and Mesopotamia, which have long been part of the Western classical canon, this amazingly complex culture in South Asia with a population that at its peak may have reached 10 percent of the world's inhabitants, was completely forgotten until 1920's. Since then, a flurry of archaeological research in Pakistan and India has uncovered a sophisticated urban culture with myriad internal trade routes and well-established sea links with Mesopotamia, standards for building construction, sanitation systems, arts and crafts, and a yet-to-be deciphered writing system. "We considered that it is high time for a team of interdisciplinary scientists to contribute to the debate about the enigmatic fate of these people," added Giosan.

The research was conducted between 2003 and 2008 in Pakistan, from the coast of the Arabian Sea into the fertile irrigated valleys of Punjab and the northern Thar Desert. The international team included scientists from the U.S., U.K., Pakistan, India, and Romania with specialties in geology, geomorphology, archaeology, and mathematics. By combining satellite photos and topographic data collected by the Shuttle Radar Topography Mission (SRTM), the researchers prepared and analyzed digital maps of landforms constructed by the Indus and neighboring rivers, which were then probed in the field by drilling, coring, and even manually-dug trenches. Collected samples were used to determine the sediments' origins, whether brought in and shaped by rivers or wind, and their age, in order to develop a chronology of landscape changes.

"Once we had this new information on the geological history, we could re-examine what we know about settlements, what crops people were planting and when, and how both agriculture and settlement patterns changed," said co-author Dorian Fuller, an archaeologist with University College London. "This brought new insights into the process of eastward population shift, the change towards many more small farming communities, and the decline of cities during late Harappan times."

The new study suggests that the decline in monsoon rains led to weakened river dynamics, and played a critical role both in the development and the collapse of the Harappan culture, which relied on river floods to fuel their agricultural surpluses.

From the new research, a compelling picture of 10,000 years of changing landscapes emerges. Before the plain was massively settled, the wild and forceful Indus and its tributaries flowing from the Himalaya cut valleys into their own deposits and left high "interfluvial" stretches of land between them. In the east, reliable monsoon rains sustained perennial rivers that crisscrossed the desert leaving behind their sedimentary deposits across a broad region.

Among the most striking features the researchers identified is a mounded plain, 10 to 20 meters high, over 100 kilometers wide, and running almost 1000 kilometers along the Indus, they call the "Indus mega-ridge," built by the river as it purged itself of sediment along its lower course.

"At this scale, nothing similar has ever been described in the geomorphological literature," said Giosan. "The mega-ridge is a surprising indicator of the stability of Indus plain landscape over the last four millennia. Remains of Harappan settlements still lie at the surface of the ridge, rather than being buried underground."

Mapped on top of the vast Indo-Gangetic Plain, the archaeological and geological data shows instead that settlements bloomed along the Indus from the coast to the hills fronting the Himalayas, as weakened monsoons

and reduced run-off from the mountains tamed the wild Indus and its Himalayan tributaries enough to enable agriculture along their banks.

"The Harappans were an enterprising people taking advantage of a window of opportunity – a kind of "Goldilocks civilization," said Giosan. "As monsoon drying subdued devastating floods, the land nearby the rivers - still fed with water and rich silt - was just right for agriculture. This lasted for almost 2,000 years, but continued aridification closed this favorable window in the end."

In another major finding, the researchers believe they have settled a long controversy about the fate of a mythical river, the Sarasvati. The Vedas, ancient Indian scriptures composed in Sanskrit over 3000 years ago, describe the region west of the Ganges as "the land of seven rivers." Easily recognizable are the Indus and its current tributaries, but the Sarasvati, portrayed as "surpassing in majesty and might all other waters" and "pure in her course from mountains to the ocean," was lost. Based on scriptural descriptions, it was believed that the Sarasvati was fed by perennial glaciers in the Himalayas. Today, the Ghaggar, an intermittent river that flows only during strong monsoons and dissipates into the desert along the dried course of Hakra valley, is thought to best approximate the location of the mythic Sarasvati, but its Himalayan origin and whether it was active during Vedic times remain controversial.

Archaeological evidence supports the Ghaggar-Hakra as the location of intensive settlement during Harappan times. The geological evidence—sediments, topography— shows that rivers were indeed sizable and highly active in this region, but most likely due to strong monsoons. There is no evidence of wide incised valleys like along the Indus and its tributaries and there is no cut-through, incised connections to either of the two nearby Himalayan-fed rivers of Sutlej and Yamuna. The new research argues that these crucial differences prove that the Sarasvati (Ghaggar-Hakra) was not Himalayan-fed, but a perennial monsoon-supported watercourse, and that aridification reduced it to short seasonal flows. By 3900 years ago, their rivers drying, the Harappans had an escape route to the east toward the Ganges basin, where monsoon rains remained reliable.

"We can envision that this eastern shift involved a change to more localized forms of economy: smaller communities supported by local rain-fed farming and dwindling streams," said Fuller. "This may have produced smaller surpluses, and would not have supported large cities, but would have been reliable."

Such a system was not favorable for the Indus civilization, which had been built on bumper crop surpluses along the Indus and the Ghaggar-Hakra rivers in the earlier wetter era. This dispersal of population meant that there was no longer a concentration of workforce to support urbanism. "Thus cities collapsed, but smaller agricultural communities were sustainable and flourished. Many of the urban arts, such as writing, faded away, but agriculture continued and actually diversified," said Fuller.

"An amazing amount of archaeological work has been accumulating over the last decades, but it's never been linked properly to the evolution of the fluvial landscape. We now see landscape dynamics as the crucial link between climate change and people," said Giosan. "Today the Indus system feeds the largest irrigation scheme in the world, immobilizing the river in channels and behind dams. If the monsoon were to increase in a warming world, as some predict, catastrophic floods such as the humanitarian disaster of 2010, would turn the current irrigation system, designed for a tamer river, obsolete."

This work was funded by the National Science Foundation, the Leverhulme Trust, Woods Hole Oceanographic Institution, the University of Aberdeen, and Louisiana State University.

http://www.sciencedaily.com/releases/2012/05/120528180043.htm

Edible Stop Signs? A Few Red Chips in the Stack Cut Snacking in Half

Once you pop the top of a tube of potato chips, it can be hard to stop munching its contents.

ScienceDaily - But Cornell researchers may have found a novel way to help: Add edible serving size markers that act as subconscious stop signs. As part of an experiment carried out on two groups of college students (98 students total) while they were watching video clips in class, researchers from Cornell's Food and Brand Lab served tubes of Lays Stackables, some of which contained chips dyed red.

In the first study of the research, which is published online this month in Health Psychology, a journal of the American Psychological Association, the red chips were interspersed at intervals designating one suggested serving size (seven chips) or two serving sizes (14 chips); in the second study, this was changed to five and 10 chips.

Unaware of why some of the chips were red, the students who were served those tubes of chips nonetheless consumed about 50 percent less than their peers: 20 and 24 chips on average for the seven-chip and 14-chip segmented tubes, respectively, compared with 45 chips in the control group; 14 and 16 chips for the five-chip and 10-chip segmented tubes, compared with 35 chips in the control group. They were also better able to

estimate how many chips they had eaten. Those in the control groups underestimated the amount of chips they had consumed by about 13 chips. Those in the "segmented" groups were able to guess within one chip.
"People generally eat what is put in front of them if it is palatable," said Brian Wansink, Cornell Food and Brand Lab director. "An increasing amount of research suggests that some people use visual indication -- such as a clean plate or bottom of a bowl -- to tell them when to stop eating."
"By inserting visual markers in a snack food package, we may be helping them to monitor how much they are eating and interrupt their semiautomated eating habits," he added.
Wansink, the John Dyson Professor of Consumer Behavior and author of the best-seller "Mindless Eating: Why We Eat More Than We Think," carried out the study with psychologists Andrew Geier of Yale University and Paul Rozin of the University of Pennsylvania.
"The effect demonstrated and replicated in these studies stands as perhaps the largest practicable procedure to decrease food intake in the literature," Wansink said. "Marking modest portion sizes promises to be an effective strategy in the attempt to reduce food intake and obesity."
He noted that the experiment reduced caloric intake among participants by about 250 calories.
"Very modest reductions in intake produced by environmental changes can, when cumulated, lead to substantial weight loss," Wansink said. "These studies could have major public health significance."
Wansink said further studies are needed among larger, more diverse groups to determine in what context segmentation cues work, exactly why they work and whether people will compensate for the reduction in food intake by eating more later.

Andrew Geier, Brian Wansink, Paul Rozin. Red potato chips: Segmentation cues can substantially decrease food intake.. Health Psychology, 2012; 31 (3): 398 DOI: 10.1037/a0027221

http://phys.org/news/2012-05-radioactive-bluefin-tuna-pacific.html

Radioactive bluefin tuna crossed the Pacific to US

Across the vast Pacific, the mighty bluefin tuna carried radioactive contamination that leaked from Japan's crippled nuclear plant to the shores of the United States 6,000 miles away - the first time a huge migrating fish has been shown to carry radioactivity such a distance.

"We were frankly kind of startled," said Nicholas Fisher, one of the researchers reporting the findings online Monday in the Proceedings of the National Academy of Sciences.
The levels of radioactive cesium were 10 times higher than the amount measured in tuna off the California coast in previous years. But even so, that's still far below safe-to-eat limits set by the U.S. and Japanese governments.
Previously, smaller fish and plankton were found with elevated levels of radiation in Japanese waters after a magnitude-9 earthquake in March 2011 triggered a tsunami that badly damaged the Fukushima Dai-ichi reactors. But scientists did not expect the nuclear fallout to linger in huge fish that sail the world because such fish can metabolize and shed radioactive substances.
One of the largest and speediest fish, Pacific bluefin tuna can grow to 10 feet and weigh more than 1,000 pounds. They spawn off the Japan coast and swim east at breakneck speed to school in waters off California and the tip of Baja California, Mexico.
Five months after the Fukushima disaster, Fisher of Stony Brook University in New York and a team decided to test Pacific bluefin that were caught off the coast of San Diego. To their surprise, tissue samples from all 15 tuna captured contained levels of two radioactive substances - cesium-134 and cesium-137 - that were higher than in previous catches.
To rule out the possibility that the radiation was carried by ocean currents or deposited in the sea through the atmosphere, the team also analyzed yellowfin tuna, found in the eastern Pacific, and bluefin that migrated to Southern California before the nuclear crisis. They found no trace of cesium-134 and only background levels of cesium-137 left over from nuclear weapons testing in the 1960s.
The results "are unequivocal. Fukushima was the source," said Ken Buesseler of the Woods Hole Oceanographic Institution, who had no role in the research.
Bluefin tuna absorbed radioactive cesium from swimming in contaminated waters and feeding on contaminated prey such as krill and squid, the scientists said. As the predators made the journey east, they shed some of the radiation through metabolism and as they grew larger. Even so, they weren't able to completely flush out all the contamination from their system.
"That's a big ocean. To swim across it and still retain these radionuclides is pretty amazing," Fisher said.
Pacific bluefin tuna are prized in Japan where a thin slice of the tender red meat prepared as sushi can fetch $24 per piece at top Tokyo restaurants. Japanese consume 80 percent of the world's Pacific and Atlantic bluefin tuna.

The real test of how radioactivity affects tuna populations comes this summer when researchers planned to repeat the study with a larger number of samples. Bluefin tuna that journeyed last year were exposed to radiation for about a month. The upcoming travelers have been swimming in radioactive waters for a longer period. How this will affect concentrations of contamination remains to be seen.

Now that scientists know that bluefin tuna can transport radiation, they also want to track the movements of other migratory species including sea turtles, sharks and seabirds.

"Pacific bluefin tuna transport Fukushima-derived radionuclides from Japan to California," by Daniel J. Madigan, Zofia Baumann, and Nicholas S. Fisher , PNAS, 2012.

http://www.eurekalert.org/pub_releases/2012-05/sumc-asp052912.php

Antioxidant shows promise as treatment for certain features of autism, Stanford study finds

A specific antioxidant supplement may be an effective therapy for some features of autism

STANFORD, Calif. - A specific antioxidant supplement may be an effective therapy for some features of autism, according to a pilot trial from the Stanford University School of Medicine and Lucile Packard Children's Hospital that involved 31 children with the disorder.

The antioxidant, called N-Acetylcysteine, or NAC, lowered irritability in children with autism as well as reducing the children's repetitive behaviors. The researchers emphasized that the findings must be confirmed in a larger trial before NAC can be recommended for children with autism.

Irritability affects 60 to 70 percent of children with autism. "We're not talking about mild things: This is throwing, kicking, hitting, the child needing to be restrained," said Antonio Hardan, MD, the primary author of the new study. "It can affect learning, vocational activities and the child's ability to participate in autism therapies."

The study appears in the June 1 issue of Biological Psychiatry. Hardan is an associate professor of psychiatry and behavioral sciences at Stanford and director of the Autism and Developmental Disabilities Clinic at Packard Children's. Stanford is filing a patent for the use of NAC in autism, and one of the study authors has a financial stake in a company that makes and sells the NAC used in the trial.

Finding new medications to treat autism and its symptoms is a high priority for researchers. Currently, irritability, mood swings and aggression, all of which are considered associated features of autism, are treated with second-generation antipsychotics. But these drugs cause significant side effects, including weight gain, involuntary motor movements and metabolic syndrome, which increases diabetes risk. By contrast, side effects of NAC are generally mild, with gastrointestinal problems such as constipation, nausea, diarrhea and decreased appetite being the most common.

The state of drug treatments for autism's core features, such as social deficits, language impairment and repetitive behaviors, is also a major problem. "Today, in 2012, we have no effective medication to treat repetitive behavior such as hand flapping or any other core features of autism," Hardan said. NAC could be the first medication available to treat repetitive behavior in autism - if the findings hold up when scrutinized further.

The study tested children with autism ages 3 to 12. They were physically healthy and were not planning any changes in their established autism treatments during the trial. In a double-blind study design, children received NAC or a placebo for 12 weeks. The NAC used was a pharmaceutical-grade preparation donated by the nutraceutical manufacturer BioAdvantex Pharma. Subjects were evaluated before the trial began and every four weeks during the study using several standardized surveys that measure problem behaviors, social behaviors, autistic preoccupations and drug side effects.

During the 12-week trial, NAC treatment decreased irritability scores from 13.1 to 7.2 on the Aberrant Behavior Checklist, a widely used clinical scale for assessing irritability. The change is not as large as that seen in children taking antipsychotics. "But this is still a potentially valuable tool to have before jumping on these big guns," Hardan said.

In addition, according to two standardized measures of autism mannerisms and stereotypic behavior, children taking NAC showed a decrease in repetitive and stereotyped behaviors.

"One of the reasons I wanted to do this trial was that NAC is being used by community practitioners who focus on alternative, non-traditional therapies," Hardan said. "But there is no strong scientific evidence to support these interventions. Somebody needs to look at them."

Hardan cautioned that the NAC for sale as a dietary supplement at drugstores and grocery stores differs in some important respects from the individually packaged doses of pharmaceutical-grade NAC used in the study, and that the over-the-counter version may not produce the same results. "When you open the bottle from the drugstore and expose the pills to air and sunlight, it gets oxidized and becomes less effective," he said.

Although the study did not test how NAC works, the researchers speculated on two possible mechanisms of action. NAC increases the capacity of the body's main antioxidant network, which some previous studies have suggested is deficient in autism. In addition, other research has suggested that autism is related to an imbalance in excitatory and inhibitory neurotransmitters in the brain. NAC can modulate the glutamatergic family of excitatory neurotransmitters, which might be useful in autism. The scientists are now applying for funding to conduct a large, multicenter trial in which they hope to replicate their findings.
"This was a pilot study," Hardan said. "Final conclusions cannot be made before we do a larger trial."
Hardan's collaborators at Stanford were Lawrence Fung, MD, a psychiatry resident; Robin Libove and Surekha Nair, MD, social science research assistants; postdoctoral scholar Tetyana Obukhanych, PhD; Lenore Herzenberg, DSc, professor of genetics and member of the Stanford Cancer Institute; and Rabindra Tirouvanziam, PhD, a former instructor in pediatric pulmonary medicine at Stanford who is now at the Emory University School of Medicine. The research was supported by a grant from the Escher Family Fund at the Silicon Valley Community Foundation. Herzenberg and Tirouvanziam are listed as inventors on two patents for NAC used for treating cystic fibrosis that are licensed by BioAdvantex Pharma, which supplied NAC for the trial. Herzenberg also has equity in BioAdvantex.

http://www.eurekalert.org/pub_releases/2012-05/bc-2cb052812.php

21st century bloodletting reduces cardiovascular risk

Two sessions of bloodletting were enough to improve blood pressure and markers of cardiovascular disease.

It seems that while the practice of bloodletting throughout history had little or no effect on most diseases, and the practice was abandoned in the 19th century, new research published in BioMed Central's open access journal BMC Medicine demonstrates that blood donation has real benefits for obese people with metabolic syndrome. Two sessions of bloodletting were enough to improve blood pressure and markers of cardiovascular disease.
Metabolic syndrome is the name given to a host of difficulties affecting people who are obese. This includes insulin resistance, glucose intolerance, dyslipidemia and hypertension and leads to an increased risk of diabetes and cardiovascular disease. Since it is known that accumulation of iron in the body is also associated with hypertension and diabetes researchers from Berlin and University Duisburg-Essen randomly assigned patients with metabolic syndrome into two groups, those undergoing iron reduction by phlebotomy and controls.
The iron-reduction patients had 300ml of blood removed at the start of the trial and between 250 and 500ml removed four weeks later. Six weeks later, allowing plenty of time for blood volume to be replaced, the patients who gave blood had a significant reduction in systolic blood pressure (from 148 mmHg to 130 mmHg) as well as reduction in blood glucose levels and heart rate, and an improvement in cholesterol levels (LDL/HDL ratio).
Prof Andreas Michalsen from the Charité-University Medical Centre, Berlin, who led this research explained, "Consecutive reduction in iron stores was able to improve markers of cardiovascular risk and glycemic control. Consequently blood donation may prevent not just diabetes but also cardiovascular disease for the obese. Obviously this treatment will not be suitable for people with anaemia however for those eligible for treatment blood donation may prevent escalation of their condition."
Effects of phlebotomy-induced reduction of body iron stores on metabolic syndrome: Results from a randomized clinical trial Khosrow S Houschyar, Rainer Lüdtke, Gustav J Dobos, Ulrich Kalus, Martina Bröcker-Preuss, Thomas Rampp, Benno Brinkhaus and Andreas Michalsen BMC Medicine (in press)

http://www.bbc.co.uk/news/health-18233717

Aspirin 'may prevent skin cancer'

An aspirin a day may protect against skin cancer, some experts believe.

By Michelle Roberts Health editor, BBC News online

People who take aspirin tablets or similar painkillers on a regular basis cut their risk of developing skin cancer - including the most deadly type - malignant melanoma - by about 15%, research suggests.
The work in the journal Cancer involved nearly 200,000 people in Denmark.
But experts say using sunscreen and avoiding too much sun are still the best ways to prevent skin cancer.

Anti-cancer pill?

In the study, approximately 18,000 of the 200,000 participants had been diagnosed with of one of three types of skin cancer - basal cell carcinoma, squamous cell carcinoma, or the rarer but more dangerous malignant melanoma. The researchers looked at the medical records of the individuals to calculate how many had been prescribed non-steroidal anti-inflammatory drugs (NSAIDs) such as aspirin, ibuprofen and naproxen over an eight-year period. Many were taking them for heart conditions or arthritis. Those who were more frequently prescribed NSAIDs were less likely to have skin cancer.
The higher the dose and the longer a person had been on the medication, the greater the protective effect.

Individuals with more than two prescriptions for NSAIDs had a 15% decreased risk for developing squamous cell carcinoma and a 13% lower risk of malignant melanoma.

NSAIDs did not appear to lower the overall risk of basal cell carcinoma - the most common and least aggressive type of skin cancer. But they did cut the risk of basal cell carcinomas developing on certain parts of the body other than the head and neck.

Aspirin

Also known as acetylsalicylic acid
Used for many years as a painkiller
Has an anti-inflammatory action
Low-dose (75mg) is already recommended for people with known cardiovascular disease to prevent stroke and heart attack
Benefits for healthy people are still unclear
Can cause fatal internal bleeding, although this is relatively rare

Limitations

The researchers from the University Hospital in Denmark say more research is needed to confirm and further explain their findings. Studies in animals suggest NSAIDs may block the growth of early pre-cancerous skin lesions, but it is not yet clear if this is also the case in humans.

Scientists already suspect that these drugs may protect against many other cancers, including bowel cancer. The researchers point out that although they found a link with prescriptions they were not able to monitor precisely how much of the drug a person actually took. Also, people can buy drugs like aspirin from a pharmacy without a prescription. And they did not look at sun exposure - the root cause of skin cancer. Experts say even if NSAIDs do offer some protection against skin cancer, people still need to be sensible in the sun.

Hazel Nunn of Cancer Research UK said: "By far and away the best way to reduce the risk of skin cancer is to enjoy the sun safely, and take care to avoid sunburn. "Sunburn's a clear sign that your skin's been damaged, and this damage can build up over time and lead to skin cancer in the future. When the sun's strong, use a combination of shade, clothes and at least SPF 15 sunscreen to protect your skin.

"There is mounting evidence that aspirin does reduce the risk of some cancers, but it's too soon to say if this includes skin cancer. Aspirin can have serious side effects - so it's important to talk to a doctor about the risks and benefits if you're thinking of taking it regularly."

http://www.sciencedaily.com/releases/2012/05/120529102346.htm

Too Much Vitamin D Can Be as Unhealthy as Too Little, Study Suggests

Scientists know that Vitamin D deficiency is not healthy. However, new research from the University of Copenhagen now indicates that too high a level of the essential vitamin is not good either.

ScienceDaily - The study is based on blood samples from 247,574 Copenhageners. The results have just been published in the reputed scientific Journal of Clinical Endocrinology and Metabolism.

Vitamin D is instrumental in helping calcium reach our bones, thus lessening the risk from falls and the risk of broken hips. Research suggests that vitamin D is also beneficial in combating cardiac disease, depression and certain types of cancers. The results from a study conducted by the Faculty of Health and Medical Sciences now support the benefits of vitamin D in terms of mortality risk. However, the research results also show higher mortality in people with too high levels of vitamin D in their bloodstream:

"We have had access to blood tests from a quarter of a million Copenhageners. We found higher mortality in people with a low level of vitamin D in their blood, but to our surprise, we also found it in people with a high level of vitamin D. We can draw a graph showing that perhaps it is harmful with too little and too much vitamin D," explains Darshana Durup, PhD student.

If the blood contains less than 10 nanomol (nmol) of vitamin per liter of serum, mortality is 2.31 times higher. However, if the blood contains more than 140 nmol of vitamin per liter of serum, mortality is higher by a factor of 1.42. Both values are compared to 50 nmol of vitamin per liter of serum, where the scientists see the lowest mortality rate.

More studies are needed

Darshana Durup emphasises that while scientists do not know the cause of the higher mortality, she believes that the new results can be used to question the wisdom of those people who claim that you can never get too much vitamin D:

"It is important to conduct further studies in order to understand the relationship. A lot of research has been conducted on the risk of vitamin D deficiency. However, there is no scientific evidence for a 'more is better' argument for vitamin D, and our study does not support the argument either. We hope that our study will inspire others to study the cause of higher mortality with a high level of vitamin D," says Darshana Durup. She adds: "We have moved into a controversial area that stirs up strong feelings just like debates on global warming

and research on nutrition. But our results are based on a quarter of a million blood tests and provide an interesting starting point for further research."

The largest study of its kind

The study is the largest of its kind -- and it was only possible to conduct it because of Denmark's civil registration system, which is unique in the Nordic countries. The 247,574 blood samples come from the Copenhagen General Practitioners Laboratory:

"Our data material covers a wide age range. The people who participated had approached their own general practitioners for a variety of reasons and had had the vitamin D level in their bloodstream measured in that context. This means that while the study can show a possible association between mortality and a high level of vitamin D, we cannot as yet explain the higher risk," explains Darshana Durup.

Therefore in future research project scientists would like to compare the results with information from disease registers such as the cancer register. Financial support is currently being sought for such projects.

D. Durup, H. L. Jorgensen, J. Christensen, P. Schwarz, A. M. Heegaard, B. Lind. A Reverse J-Shaped Association of All-Cause Mortality with Serum 25-Hydroxyvitamin D in General Practice, the CopD Study. Journal of Clinical Endocrinology & Metabolism, 2012; DOI: 10.1210/jc.2012-1176

http://www.sciencedaily.com/releases/2012/05/120529113258.htm

Bananas Are as Beneficial as Sports Drinks, Study Suggests

Bananas have long been a favorite source of energy for endurance and recreational athletes. Bananas are a rich source of potassium and other nutrients, and are easy for cyclists, runners or hikers to carry.

ScienceDaily - Research conducted at Appalachian State University's Human Performance Lab in the Kannapolis-based North Carolina Research Campus (NCRC) has revealed additional benefits. "We wanted to see which was more beneficial when consumed during intense cycling -- bananas or a carbohydrate sports drink," said Dr. David C. Nieman, director of the human performance lab and a member of the College of Health Sciences faculty at Appalachian. "We found that not only was performance the same whether bananas or sports drinks were consumed, there were several advantages to consuming bananas," he said.

The bananas provided the cyclists with antioxidants not found in sports drinks as well as a greater nutritional boost, including fiber, potassium and Vitamin B6, the study showed. In addition, bananas have a healthier blend of sugars than sports drinks. The study, funded by Dole Foods, has been published in the peer-reviewed online journal PLoS ONE published by the nonprofit Public Library of Science.

For the study, trained cyclists consumed either a cup of carbohydrate drink or half a banana every 15 minutes during a 75-kilometer simulated road race lasting 2.5 to 3 hours. Blood samples taken from the cyclists before and after the exercise were analyzed at the NCRC Metabolomics Laboratory for more than 100 metabolites -- molecules associated with metabolism.

"Bananas come prepackaged with fiber, nutrients and antioxidants," said Nieman, adding the research translates to any exercise. "The mode of exercise is not the issue. I think there are a lot of athletes who don't like the thought of drinking carbohydrate sports drinks, which are essentially flavored sugar water," he said. "This type of research shows that you can have healthier carbohydrate sources before and after exercise that will support athletic performance just as well as a sports drink," Nieman said.

About the research team Other members of the research team from Appalachian were Dr. Dru Henson, Department of Biology; Dr. Andrew Shanely, Human Performance Lab; Dr. Amy M. Knab, Human Performance Lab; Dr. Lynn Cialdella-Kam, Human Performance Lab; Dr. Nicholas D. Gillitt, Dole Nutrition Research Laboratory, N.C. Research Campus; Dr. Wei Sha, UNC Charlotte and N.C. Research Campus; and Dr. Fuxia Jin, Dole Nutrition Research Laboratory, N.C. Research Campus.

David C. Nieman, Nicholas D. Gillitt, Dru A. Henson, Wei Sha, R. Andrew Shanely, Amy M. Knab, Lynn Cialdella-Kam, Fuxia Jin. Bananas as an Energy Source during Exercise: A Metabolomics Approach. PLoS ONE, 2012; 7 (5): e37479 DOI: 10.1371/journal.pone.0037479

http://bit.ly/KR3Z9Z

Researchers Discover Hacker-Ready Computer Chips

A pair of security researchers in the U.K. have released a paper [PDF] documenting what they describe as the "first real world detection of a backdoor" in a microchip - an opening that could allow a malicious actor to monitor or change the information on the chip.

By John Villasenor

The researchers, Sergei Skorobogatov of the University of Cambridge and Christopher Woods of Quo Vadis Labs, concluded that the vulnerability made it possible to reprogram the contents of supposedly secure memory and obtain information regarding the internal logic of the chip. I discussed the possibility of this type of hardware vulnerability in the August 2010 Scientific American article "The Hacker in Your Hardware."

The security breach is a particular concern because of the type of chip involved. The affected chip, a ProASIC3 A3P250, is a field programmable gate array (FPGA). These chips are used in an enormous variety of applications, including communications and networking systems, the financial markets, industrial control systems, and a long list of military systems. Each customer configures an FPGA to implement a unique—and often highly proprietary—set of logical operations. For example, a customer in the financial markets might configure an FPGA to make high speed trading decisions. A customer in aviation might use an FPGA to help perform flight control. Any mechanism that could allow unauthorized access to the internal configuration of an FPGA creates the risk of intellectual property theft. In addition, the computations and data in the chip could be maliciously altered.

Assuming that the researchers' claims stand up to scrutiny, there are at least two important questions that immediately get raised. First, how did this vulnerability end up there in the first place? Second, what does it mean?

Regarding the source of the backdoor, some people are hinting that Chinese sources may be to blame. But, as Robert Graham of Errata Security explains in a blog post titled "Bogus story: no Chinese backdoor in military chip," it's premature to point fingers:

. . . it's important to note that while the researchers did indeed discover a backdoor, they offer only speculation, but no evidence, as to the source of the backdoor.

And, as Graham also observed, the term "military chip" can be deceptive as well, as these chips are used in a wide variety of applications, many of them unrelated to the military.

It's possible that this vulnerability was inserted at the behest of a nation state. But it's also possible that the backdoor is due to carelessness, not malice. Someone in the design process could have inserted the backdoor to enable testing, without realizing that it would later be discovered, publicized, and potentially exploited.

Regardless of the source of the vulnerability, its presence should serve as a wake-up call to the importance of hardware security. Cybersecurity, of course, is a well-recognized concern. Yet the overwhelming majority of cybersecurity vulnerabilities identified to date have involved software, which is the set of instructions that describe how a task inside a chip or system is performed. Software can be replaced, updated, altered, and downloaded from the Internet. By contrast, a hardware vulnerability is built in to the actual circuitry of a chip. As a result, it can be very difficult to address without replacing the chip itself.

This certainly won't be the last time that a hardware security vulnerability will be identified. As chips continue to get more complex, hardware security flaws—whether malicious or accidental—will increasingly become a part of the cybersecurity landscape. We should put in place pre-emptive measures to minimize the risks they might pose.

http://nyti.ms/L8CDyP

How the Scent of Fear May Be Picked Up by Others

THE HYPOTHESIS Fish "smell" danger, and perhaps humans do, too.

By AMANDA SCHAFFER

THE INVESTIGATORS Ajay Mathuru and Suresh Jesuthasan of the Biomedical Sciences Institutes in Singapore.

When one fish is injured, others nearby may dart, freeze, huddle, swim to the bottom or leap from the water. The other fish know that their school mate has been harmed. But how?

In the 1930s, Karl von Frisch, the famous ethologist, noted this behavior in minnows. He theorized that injured fish release a substance that is transmitted by smell and causes alarm. But Dr. von Frisch never identified the chemical composition of the signal. He just called it schreckstoff, or "scary stuff."

Schreckstoff is a long-standing biological mystery, but now researchers may have solved a piece of it. In a study published in February in Current Biology, Suresh Jesuthasan, a neuroscientist at the Biomedical Sciences Institutes in Singapore, and his colleagues isolated sugar molecules called chondroitins from the outer mucus of zebra fish.

They found that when these molecules are broken into fragments, as they might be when the fish's skin is injured, and added to water, they prompt alarm behavior in other fish. At low concentrations, the fish were "mildly perturbed," Dr. Jesuthasan said. At high concentrations, they stopped darting altogether and froze in place for an hour or longer. He and his colleagues also showed that neurons in the olfactory bulb of these fish were activated when exposed to the sugar fragments. In a sense, the fish seemed to "smell" the injury.

The work could have broad implications for understanding fear and panic in other animals, and perhaps in humans, said Lisa Stowers, a neuroscientist at the Scripps Research Institute who was not involved in the

research. Researchers have long struggled for better ways to help patients who are chronically prone to panic or anxiety.

Fear can be a useful tool for an individual animal. But it's even more useful for one animal to be able to communicate its alarm - quickly - to others of its kind. Many lower animals seem to rely on smell to accomplish this, but surprisingly little is known of the substances used, or how they are produced or perceived.

The best-known alarm signals are used by bees and ants. The European honeybee releases a mixture of compounds after a sting. A major component is a molecule called isopentyl acetate, which rouses alarm in other honeybees. "Carpenter ants release compounds called formic acid and n-undecane to signal danger to their fellows," Dr. Jesuthasan said. "Ants that sense these chemicals stop moving, swing their antennae and then begin moving quickly. If an enemy is spotted, they become aggressive. The exact response depends on the ratio of the chemicals."

Sea urchins release substances when their bodies are crushed that cause other sea urchins to flee. Similar responses have been shown in marine snails, tunicates and tadpoles. But the chemical nature of the signals is not known, Dr. Jesuthasan added.

In a 2008 paper published in Science, Marie-Christine Broillet, a neuroscientist at the University of Lausanne in Switzerland, identified the system responsible for picking up on alarm signals in mice: a few hundred neurons, called the Grueneberg ganglion, in the tip of the nose. But Dr. Broillet did not identify the signaling molecules — "a major scientific challenge," she said.

Chondroitin fragments may strike fear into the hearts of zebra fish, and perhaps even other fish, but they may mean nothing to other animals. "Fear pheromones tend to be species-specific," said Ajay Mathuru, a neuroscientist in Dr. Jesuthasan's lab. Animals need to "send warning signals to their friends," rather than "tip off the enemy," he added, though examples do exist of predators picking up on the panicked cues of prey.

Animals living in different environments may need different kinds of signaling molecules, said Marcus Stensmyr, an evolutionary biologist at the Max Planck Institute for Chemical Ecology in Germany. Chondroitin fragments, which are relatively large, do not travel through air as they do through water, potentially limiting their usefulness to terrestrial animals. In humans, the notion that pheromones provoke fear and other responses remains controversial. "Ninety-nine percent of scientists probably don't believe pheromones exist in humans," said Dr. Murali Doraiswamy, a professor of psychiatry at Duke University Medical Center, though research "remains at a primitive stage."

Certainly, visual cues, thoughts and memories play a more important role in generating fear behavior in humans. "Even if you sprayed a person with a fearful perfume, if they could see with their eyes that nothing was happening, they wouldn't react the way a fish would," Dr. Doraiswamy said.

In zebra fish, the olfactory bulb has a close anatomical connection to a brain area called the habenula, which may also play a central role in mediating fear, Dr. Jesuthasan said.

In previous research, he and his colleagues disrupted signaling in the fish's habenula and showed that this made them more likely to act "helpless" at the prospect of an electric shock. Those with abnormal signaling in the habenula had "an exaggerated fear response," Dr. Jesuthasan said.

In humans, the role of the habenula is hotly debated. This is partly because the structure is small and situated deep in the brain, making it difficult to study using functional magnetic resonance imaging. It has been implicated in many different types of behavior, including stress, pain, anxiety, learning and reproduction, Dr. Stowers said. But for now, "its function is still a mystery."

Even so, the brain areas implicated in the new zebra fish study could shed light on the neural circuitry involved in fear, even if those responses are set off by cues other than smell. And Dr. Jesuthasan's group has purified molecules that can touch off alarm in the absence of other cues, an important step, Dr. Stowers said.

Now the researchers can "activate, mark and study the neural circuits involved in fear responses in a way that no one has before," she said.

http://nyti.ms/K2wHBE

Stubborn Infection, Spread by Insects, Is Called 'The New AIDS of the Americas'

Chagas disease, caused by parasites transmitted to humans by blood-sucking insects, has been named "the new AIDS of the Americas" in a lengthy editorial published in PLoS Neglected Tropical Diseases.

By DONALD G. McNEIL Jr.

The authors, several of whom are tropical disease experts from Baylor College of Medicine in Houston, argue that the dangerous spread of Chagas through this hemisphere somewhat resembles the early spread of H.I.V.

Chagas is also known as American trypanosomiasis, because the bugs carry single-celled parasites called trypanosomes. (Their best-known relative, spread by tsetse flies in Africa, causes sleeping sickness.)
Like AIDS, the authors say, Chagas disease has a long incubation time and is hard or impossible to cure.
Chagas infects up to eight million people in the hemisphere, mostly in Bolivia, Mexico, Colombia and Central America. But more than 300,000 of the infected live in the United States, many of them immigrants.
The disease can be transmitted from mother to child or by blood transfusion. About a quarter of its victims eventually will develop enlarged hearts or intestines, which can fail or burst, causing sudden death. Treatment involves harsh drugs taken for up to three months and works only if the disease is caught early.
The drugs are not as expensive as AIDS drugs, but there are shortages in poor countries. Because it is a disease of the poor, little money is spent on finding new treatments. “Both diseases are highly stigmatizing,” the editorial noted. Immigrants may not get medical treatment, making Chagas more likely to spread.

http://www.bbc.co.uk/news/health-18250455

'Lung washing' could boost transplants

"Washing" lungs before they are transplanted could increase numbers of the organs suitable for donation, according to doctors in Newcastle.

By James Gallagher Health and science reporter, BBC News

Only one in five donated lungs are good enough to be transplanted safely. A trial, being led by Newcastle University, is trying to improve the quality of the lungs by pumping nutrients and oxygen through them.
The British Transplantation Society said the technique could "dramatically" increase the number of lungs used.
Around a quarter of people waiting for an organ transplant die in the first year on a transplant list.
The lungs are delicate organs and the events which lead to a donor's death can also damage the lungs. It is why so few can be transplanted.

Spruce up

Doctors are using a modified heart-lung bypass machine to prepare the organs. Air is pumped into the lungs, which can absorb oxygen, while nutrients are pumped through the blood vessels. The technique called "ex-vivo lung perfusion" can clear a build-up of water on the lungs or can treat them with medication to clear infection.
Prof Andrew Fisher, who is leading the trial, told the BBC that the technique allows doctors to monitor lungs to see if their function improves and become suitable for transplant.
"It won't undo permanent damage, such as from emphysema, but it helps lungs that should be functioning well, but aren't." He estimates that it will mean doctors can assess twice the number of lungs they currently do.
Prof Fisher said: "How many will be usable is unknown. If it is only half that's still a 50% increase in the number of lung transplants and that's going to make a huge difference." He described improving the quality of organs as the "new frontier" for transplants after "mastering" surgery and rejection drugs.

'Potential to transform'

Seventeen patients have already received lungs that have been prepared through this technique. The trial is also taking place at NHS transplant centres in London, Cambridge, Birmingham, Manchester and Newcastle.
Doctors will need to check that there are no complications, such as more infections, as a result of the procedure.
Prof Chris Watson, the president of the British Transplantation Society, said: "Currently around a quarter of potential recipients die in the first year while waiting for suitable lungs and this study has the potential to transform that situation for the benefit of all the patients waiting for a lung transplant."
He thinks similar procedures will eventually be used for many organs: "I think it is something that will take off," he told the BBC.
The Cystic Fibrosis Trust is funding some of the research. Its chief executive Ed Owen said: "Sadly many people currently die before lungs become available. "The ex-vivo lung perfusion research is revolutionary for people with cystic fibrosis as it makes more lungs available and therefore offers real hope and life for many people." NHS Blood and Transplant said there was a "severe shortage" of organs and that ways of using donate organs more effectively were "desperately needed".

http://www.eurekalert.org/pub_releases/2012-05/wsw-rst052912.php

Researchers say tart cherries have 'the highest anti-inflammatory content of any food'

Tart cherries may help millions reduce inflammation to manage pain, according to new research

LANSING, Mich. – Tart cherries may help reduce chronic inflammation, especially for the millions of Americans suffering from debilitating joint pain and arthritis, according to new research from Oregon Health & Science University presented today at the American College of Sports Medicine Conference (ACSM) in San Francisco, Calif.[1] In fact, the researchers suggest tart cherries have the "highest anti-inflammatory content of any food" and can help people with osteoarthritis manage their disease.

In a study of twenty women ages 40 to 70 with inflammatory osteoarthritis, the researchers found that drinking tart cherry juice twice daily for three weeks led to significant reductions in important inflammation markers – especially for women who had the highest inflammation levels at the start of the study.

"With millions of Americans looking for ways to naturally manage pain, it's promising that tart cherries can help, without the possible side effects often associated with arthritis medications," said Kerry Kuehl, M.D, Dr.PH., M.S., Oregon Health & Science University, principal study investigator. "I'm intrigued by the potential for a real food to offer such a powerful anti-inflammatory benefit – especially for active adults."

Often characterized as "wear and tear" arthritis, osteoarthritis is the most common type of arthritis. Athletes are often at a greater risk for developing the condition, given their excessive joint use that can cause a breakdown in cartilage and lead to pain and injury, according to the Arthritis Foundation.

The inflammation benefits could be particularly important for athletes, according to Kuehl's previous research. In a past study he found that people who drank tart cherry juice while training for a long distance run reported significantly less pain after exercise than those who didn't.[2]

Go Red Instead to Manage Pain

Along with providing the fruit's bright red color, the antioxidant compounds in tart cherries – called anthocyanins – have been specifically linked to high antioxidant capacity and reduced inflammation, at levels comparable to some well-known pain medications.[3]

Previous research on tart cherries and osteoarthritis conducted by researchers at Baylor Research Institute found that a daily dose of tart cherries (as cherry extract) helped reduce osteoarthritis pain by more than 20 percent for the majority of men and women.[4] And the same compounds linked to cherries' arthritis benefits have now shown promise for athletes and sports recovery to help relieve muscle and joint soreness.

According to Director of Sports Nutrition at the University of Pennsylvania Medical Center for Sports Medicine, Leslie Bonci, MPH, RD, CSSD, LDN, who has incorporated tart cherries into the training menu of both her professional athletes and active clients as a natural and easy way to manage pain that also tastes great, "Why not eat red when there's so much science to support the anti-inflammatory benefits of this Super Fruit? And for athletes whose palates prefer the tart-sweet flavor profile of tart cherries, it's the optimal ingredient."

Available every day of the year in dried, frozen and juice forms, tart cherries are a versatile ingredient to include in any training or inflammation-fighting diet.

To learn more about the body of research supporting tart cherries' pain-fighting properties, visit www.choosecherries.com to download The Red Report. There, you can also reference The Red Recovery Routine, a guide to help people train to manage pain with tart cherries.

The Cherry Marketing Institute (CMI) is an organization funded by North American tart cherry growers and processors. CMI's mission is to increase the demand for tart cherries through promotion, market expansion, product development and research. For more information on the science supporting the unique health benefits of cherries and for cherry recipes and menu ideas, visit www.choosecherries.com.

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http://www.eurekalert.org/pub_releases/2012-05/plos-tss052512.php

The special scent of age

People can identify other people's ages based on their body odors, according to a study published May 30 in the open access journal PLoS ONE.

Much of this ability is based on identifying odors of elderly individuals, but contrary to popular belief, the so-called 'old-person smell' is less intense and less unpleasant than body odors of middle-aged and young individuals, the researchers report.

Like non-human animals, human body odors contain an array of chemical components that can transmit various types of social information, and the composition of these odors changes across a person's lifespan. To test whether people can intuitively sense these changes, the researchers, led by Johan Lundström of the Monell Chemical Senses Center in Philadelphia, Pennsylvania, collected body odors, in the form of a t-shirt with underarm pads slept in for five nights, from young, middle-aged, and old participants. These scents were then assessed by a different set of evaluators, who were asked to rate the intensity and pleasantness of each odor,

identify which of two scents came from the older individual, and estimate the age of the individual who produced each sample.
The participants were able to discriminate between the three donor age categories, and the researchers found that it was odors from the old-age group that were driving this ability. Interestingly, however, evaluators rated body odors from the old-age group as less intense and less unpleasant than odors from the other two age groups.
"Elderly people have a discernible underarm odor that younger people consider to be fairly neutral and not very unpleasant," said Lundström. "This was surprising given the popular conception of old age odor as disagreeable. However, it is possible that other sources of body odors, such as skin or breath, may have different qualities."
Mitro S, Gordon AR, Olsson MJ, Lundstrom JN (2012) The Smell of Age: Perception and Discrimination of Body Odors of Different Ages. PLoS ONE 7(5): e38110. doi:10.1371/journal.pone.0038110
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http://www.eurekalert.org/pub_releases/2012-05/thc-wii053012.php

When is it ethical to prescribe placebos?

The American Medical Association's Code of Ethics prohibits physicians from prescribing treatments that they consider to be placebos unless the patients know this and agree to take them anyway.

But this policy is not clearly the best way to protect or benefit patients, concludes an The American Medical Association's Code of Ethics prohibits physicians from prescribing treatments that they consider to be placebos unless the patients know this and agree to take them anyway. But this policy is not clearly the best way to protect or benefit patients, concludes an article in the Hastings Center Report. A commentary by two AMA bioethicists responding to the article also appears in the journal.
Placebos are commonly understood to be inert treatments, such as sugar pills, that have no pharmacological effect, but the AMA defines placebos more narrowly, as therapies that a physician believes lack a specific pharmacological effect on the conditions being treated. The physician's belief may or may not align with the prevailing medical view of a treatment. "There are borderline and controversial cases, such as acupuncture and antidepressants, in which individual physicians might reasonably disagree with the medical community's consensus about whether a treatment is an active treatment or a placebo," writes Anne Barnhill, a philosopher and bioethicist who is studying social work at Columbia University.
The article cites a recent poll of American internists and rheumatologists that found that a significant number of them admit to giving patients placebos without disclosing the therapies as such. While some placebo use is patently unethical – providing a treatment that "has no scientific basis and is dangerous, is calculated to deceive the patient by giving false hope, or which may cause the patient to delay in seeking proper care" – other uses of placebos are widely seen as ethical, writes Barnhill.
Some placebos might offer medical benefit to patients with certain conditions, Barnhill notes, and the limited available data suggest that placebos are more effective when presented as active treatments. As a result, she adds, some bioethicists have argued that an undisclosed placebo is the best available treatment for some patients. "If the best available treatment is sometimes an undisclosed placebo," she writes, "then the AMA's policy prohibits physicians from offering the best available treatment in some cases."
In addition to failing to benefit patients, the AMA policy may not meet two of its other goals: protecting patients' autonomy and their trust in physicians. The rationale for requiring physicians to disclose their belief that a treatment is a placebo is that patients need this information in order to give informed consent about whether to take the treatment. Informed consent is essential to patient autonomy. But it is unknown whether patients find this information relevant to their decision-making, Barnhill says, because "there's little data on patients' attitudes toward placebos."
Because of this lack of data, Barnhill also argues that the AMA policy does not help protect patients' trust in physicians. "The AMA seems to assume that uncovering undisclosed placebo use reduces patients' trust in physicians. But this is not a given," she writes. "When they uncover undisclosed placebo use, patients might conclude that their physicians are untrustworthy liars or quacks, or that their physicians do not believe that they are truly sick – or, that their physicians are open-minded, cutting-edge, and savvy about mind-body connections."
Barnhill recommends that the AMA consider revising its policy on placebo use. If the goal is to protect patients from harm, safeguard their trust, and respect their autonomy, she says, then rather than requiring physicians to

disclose their personal belief about whether a treatment is a placebo, the policy might require physicians to report on the medical community's consensus on the treatment's status.
In the same issue of the Hastings Center Report is a commentary by Bette-Jane Crigger, director of Ethics Policy for the AMA and secretary of the Council on Ethical and Judicial Affairs, which wrote its ethical guidelines on placebo use, and Matthew K. Wynia, director of the AMA's Institute of Ethics. Regarding Barnhill's recommendation that the placebo policy be based on professional consensus, rather than individual doctor's judgment, they write, "We'd be tempted to agree but, as in so much of medicine, it isn't clear that a strong consensus is actually possible here." How, they ask, should doctors distinguish between so-called impure placebos – medications that have a pharmacological effect on some illnesses but not necessarily for the ones for which they are being prescribed – from off-label prescribing?
Crigger and Wynia emphasize that the overarching intent of AMA policy is to encourage physicians to be honest with their patients. "If there is professional disagreement on how or whether a particular pharmacologic agent works, then patients deserve to know that," they write. "If a doctor holds an outlier view, then his or her patients deserve to know that as well.

http://www.eurekalert.org/pub_releases/2012-05/e-kib053012.php

Ketamine improved bipolar depression within minutes

Reports new study in Biological Psychiatry

Philadelphia, PA, - Bipolar disorder is a serious and debilitating condition where individuals experience severe swings in mood between mania and depression. The episodes of low or elevated mood can last days or months, and the risk of suicide is high.
Antidepressants are commonly prescribed to treat or prevent the depressive episodes, but they are not universally effective. Many patients still continue to experience periods of depression even while being treated, and many patients must try several different types of antidepressants before finding one that works for them. In addition, it may take several weeks of treatment before a patient begins to feel relief from the drug's effects.
For these reasons, better treatments for depression are desperately needed. A new study in Biological Psychiatry this week confirms that scientists may have found one in a drug called ketamine.
A group of researchers at the National Institute of Mental Health, led by Dr. Carlos Zarate, previously found that a single dose of ketamine produced rapid antidepressant effects in depressed patients with bipolar disorder. They have now replicated that finding in an independent group of depressed patients, also with bipolar disorder. Replication is an important component of the scientific method, as it helps ensure that the initial finding wasn't accidental and can be repeated.
In this new study, they administered a single dose of ketamine and a single dose of placebo to a group of patients on two different days, two weeks apart. The patients were then carefully monitored and repeatedly completed ratings to 'score' their depressive symptoms and suicidal thoughts.
When the patients received ketamine, their depression symptoms significantly improved within 40 minutes, and remained improved over 3 days. Overall, 79% of the patients improved with ketamine, but 0% reported improvement when they received placebo.
Importantly, and for the first time in a group of patients with bipolar depression, they also found that ketamine significantly reduced suicidal thoughts. These antisuicidal effects also occurred within one hour. Considering that bipolar disorder is one of the most lethal of all psychiatric disorders, these study findings could have a major impact on public health.
"Our finding that a single infusion of ketamine produces rapid antidepressant and antisuicidal effects within one hour and that is fairly sustained is truly exciting," Dr. Zarate commented. "We think that these findings are of true importance given that we only have a few treatments approved for acute bipolar depression, and none of them have this rapid onset of action; they usually take weeks or longer to have comparable antidepressant effects as ketamine does."
Ketamine is an N-methyl-D-aspartate (NMDA) receptor antagonist, which means that it works by blocking the actions of NMDA. Dr. Zarate added, "Importantly, confirmation that blocking the NMDA receptor complex is involved in generating rapid antidepressant and antisuicidal effects offers an avenue for developing the next generation of treatments for depression that are radically different than existing ones."
The article is "Replication of Ketamine's Antidepressant Efficacy in Bipolar Depression: A Randomized Controlled Add-On Trial" by Carlos A. Zarate Jr., Nancy E. Brutsche, Lobna Ibrahim, Jose Franco-Chaves, Nancy Diazgranados, Anibal Cravchik, Jessica Selter, Craig A. Marquardt, Victoria Liberty, and David A. Luckenbaugh (doi: 10.1016/j.biopsych.2011.12.010). The article appears in Biological Psychiatry, Volume 71, Issue 11 (June 1, 2012), published by Elsevier.

Full text of the article is available to credentialed journalists upon request; contact Rhiannon Bugno at +1 214 648 0880 or Biol.Psych@utsouthwestern.edu. Journalists wishing to interview the authors may contact Dr. Carlos Zarate at +1 301 451 0861 or zaratec@mail.nih.gov.

http://bit.ly/MjSkVe

Carbon Found in Mars Meteorites (And Why It Has Nothing to Do With Martian Life)

When the Tissint meteorite crashed to Earth in Morocco last year, international drama ensued.

By Jeffrey Marlow

The charred pieces of splintered rock were particularly coveted because they came from Mars, and local tribesmen, meteorite collectors, and scientists jockeyed for position. One of the first scientists to get his hands on Tissint was Andrew Steele, a senior staff scientist at the Carnegie Institution of Washington, and while he cryptically previewed his findings at the Conference on Life Detection in Extraterrestrial Samples earlier this year, some of his results were published online last week in Science.

Steele and his team examined 11 martian meteorites in all, using Raman imaging spectroscopy to search for carbon-containing molecules. Carbon, of course, is the central atom in life as we know it, forming the backbones of sugars, lipids, amino acids, and other cellular building blocks, so its detection is an important step in the search for life beyond Earth.

The biggest worry in any carbon-based study of meteorites is contamination from Earth's pervasive biosphere. Most of our planet's surface is teeming with microbes (the atmosphere, as well, is one giant microbial suspension) so it's hard to keep a newly fallen meteorite truly isolated from terrestrial carbon.

But Steele's use of rock-penetrating Raman spectroscopy helps allay these concerns by peering inside the meteorites. Steve Chemtob is a geochemist at the California Institute of Technology who regularly applies Raman techniques to environmental samples. "The distance that the laser penetrates depends on the material," he says, "but most of the Raman excitation is happening at the focal plane, so by moving the sample up and down, you can analyze targets beneath the surface." Under the best circumstances, Chemtob notes, it's possible to get reliable spectra up to hundreds of micrometers inside a rock.

By making sure all of their spectra were taken 5 to 10 micrometers inside the meteorites and far away from any "visible cracks," the researchers were confident that they measured native molecules and avoided the contamination bugaboo. The fact that Tissint, the most recently fallen meteorite, exhibited just as much carbon as the other nine samples gives the researchers additional confidence that the signal was real.

In what may be the first recorded application of the interplanetary "5-second rule," Steele suggests that the minimal time Tissint spent on the Earth's surface makes it exceedingly unlikely that the detected carbon is terrestrial.

The Raman spectra had a few telltale peaks, jolts of energy released at given wavelengths in response to laser excitation, that point to certain types of materials. The shapes of the peaks - narrow or wide? smooth or noisy? - indicate how closely the target resembles the spectral library's reference samples. "The shifts in the position of a band in a Raman spectrum can indicate a gradual structural change or mineral transformation," says Chemtob. Steele used this principle to examine the most suggestive peaks at 1350 and 1590 wavenumbers. Based on the peaks' positions and shapes, Steele believes he's found "macromolecular carbon" (MMC), a catchall term that encompasses anything from an amorphous blob of linked carbon atoms to slightly more coherent sheets of regularly spaced carbons (i.e., graphite). The team used another mouthful of an analytical technique, laser desorption ionization mass spectroscopy, to identify polycyclic aromatic hydrocarbons (PAHs) in one particular meteorite. PAHs are more-structured carbon-based molecules whose potential role in the origin of life is perennially debated at astrobiology conferences.

Carbon is a necessary component of life, but its mere presence certainly doesn't guarantee that anything has been slithering across the surface of Mars. The secret to establishing the carbon's role in potential martian biology is knowing the company it keeps, so the team looked to nearby minerals for further clues about the MMC.

What they found was a disappointment to tabloid writers eager to proclaim the discovery of little green men: The metal oxides, pyroxenes, and olivines that hosted the MMC are consistent with the extensive volcanism that geologists believe has paved most of the planet's surface. Steele pulls off the band-aid quickly: "Because MMC was always associated with igneous phases," he writes, "we conclude that it crystallized from the host magma. This textural relationship negates any biological origin of the MMC and PAHs."

The apparent pervasiveness of abiotic carbon in martian samples confirms a growing sense that the key questions of future astrobiological work will center around not just the abundance of carbon, but its structure and molecular form. After all, in the search for life beyond Earth, not all carbon is created equal.

http://www.sciencedaily.com/releases/2012/05/120530152034.htm

Why Earth Is Not an Ice Ball: Possible Explanation for Faint Young Sun Paradox

More than 2 billion years ago, a much fainter sun should have left Earth as an orbiting ice ball, unfit to develop life as we know it today.

ScienceDaily - Why Earth avoided the deep freeze is a question that has puzzled scientists, but Purdue University's David Minton believes he might have an answer.

"If you go back in time to about 2 billion years ago, the Earth should have been frozen over," said Minton, an assistant professor of earth, atmospheric and planetary sciences. "There's a lot of geological evidence that the Earth wasn't frozen over. So, what is not equal? That is the Faint Young Sun Paradox."

Minton has offered a new explanation of why Earth avoided freezing over during a period when, according to geological and astrophysical observations, the sun burned at about only 70 percent of its current brightness. In short, he believes our planet might have been in a warmer place.

"I calculated to keep the Earth from being frozen over at the beginning of its history, it would have to be 6 or 7 percent closer to the sun than it is now," Minton said. "It's a few million miles, but from an orbital mechanics standpoint, it's not that far. The question is what could make a planet move from one location to another?"

Minton proposes Earth may have migrated from the sun over time through a process called planet-planet scattering, which occurs when one planet or more is ejected from its orbit, an increase in orbital separation occurs, or when planets collide. He presented his explanation recently at the Space Telescope Science Institute in Baltimore.

There are many possible ways a planet could move, but Minton said most alternatives could be ruled out because of the timeline involved.

"You have a huge time scale range from 1 billion to 10,000 years ago to work with," Minton said. "While most theories can be ruled out, planet-planet scattering is not ruled out. When a planet system or solar system forms there is no knowledge of how long they will be stable. They form and then they can go unstable in some time scale, and that time scale is set arbitrarily. Most of the instabilities happen early, and the longer you go in history, the more rare instabilities become. But rare does not mean never, and rare events can happen."

Minton speculates two proto-Venus planets existed at one point and went into a chaotic and unstable phase, crossing Earth's path and boosting us to our familiar orbit.

The two proto-Venus planets then collided, forming the planet Venus that exists today.

"One way we could have ruled this out would be if Venus had a geological history older than 2 billion years ago. We know, though, Venus is a relatively young planet." The oldest surface on Venus is estimated to be 500 million to 700 million years old, a relatively young surface by planetary science standards. Impact craters on Earth can stretch back 1 billion to 2 billion years old, with a variety of ages on the surface.

"Venus looks like it became one age all at once," Minton said. "Venus could look like it does because at some point in the last billion years it was two planets that collided and had this catastrophic event. This hypothesis of the Faint Young Sun Paradox fits the evolution of Venus."

Minton will continue the research, which, if proven, could have several ramifications.

"It could say something about the evolution of life on Earth," Minton said. "Depending on when it happened, it could have had a major effect on the Earth's biosphere. You're basically shifting the Earth's orbit from one area to another pretty dramatically."

Minton said researchers from numerous disciplines have worked to solve the Faint Young Sun Paradox, including those from solar physics, astrophysics, geology, climatology and planetary sciences.

"It's one of the most all-inclusive subject areas in earth science because trying to understand it requires communicating with all of these different fields," he said.

http://phys.org/news/2012-05-nonvolatile-white-light-emitting-liquid-coatable.html

Development of nonvolatile white light-emitting liquid that is coatable on diverse range of materials

A Japanese research team developed a nonvolatile liquid material which emits white light at room temperature.

A Japanese research team headed by Dr. Takashi Nakanishi of the National Institute for Materials Science developed a nonvolatile liquid material which emits white light at room temperature.

Because lighting devices account for about 20% of all electric power consumption, innovative materials and technological improvements are desired in order to reduce emissions of greenhouse effect gases (GHG). In particular, high expectations are placed on organic materials which emit white light as a light source material for next-generation lighting, replacing today's incandescent light bulbs and fluorescent tubes. Although the

organic materials which have been developed to date display a white light-emitting property when dispersed in a solution, the molecules tend to aggregate when the solution is coated on a substrate and the solvent is evaporated. This problem is the reason why these materials cannot fully demonstrate their intrinsic white-light emitting performance. Furthermore, from the viewpoint of the manufacturing process, an organic material which can be prepared by a simple method, without use of volatile organic solvents, achieving high brightness, homogeneous white light-emission, had been desired.

Dr. Nakanishi's team developed a liquid material with blue light fluorescence which is nonvolatile, has a melting point of approximately -45°C, and solves the problem of molecule aggregation, by modifing highly flexible branched alkyl chains around the molecule that can emit fluorescence.

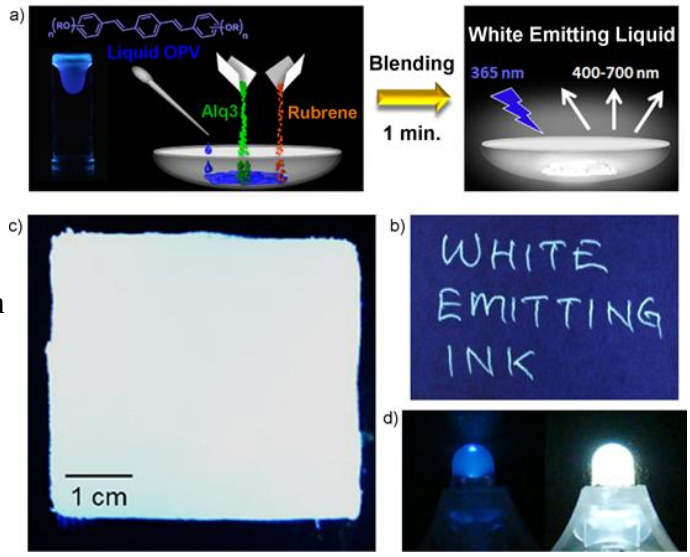


Fig: (a) Preparation of white light-emitting paste material by mixing solid dyes of green color (Alq3) and orange (rubrene) in a room temperature OPV iquid. (b) White light-emission of characters written with a ballpoint pen (365nm UV irradiation). (c) Large area coating emits white light on area of 5 x 5 cm2 (365nm UV irradiation). (d) 375nm UV-LED light-emitting photograph. (Left) Without coating with white light-emitting paste and (right) with coating.

This material is a liquid with a room temperature viscosity of approximately 1.0 Pa·s, which is similar to that of lubricating oil, and does not require use of a volatile organic solvent. It displays blue light emission with an absolute fluorescent quantum yield of approximately 50%. A white light-emitting paste material can also be prepared by mixing a small amount of luminescent dyes in solid powder in the liquid. Various materials which emit high brightness white light even when coated were successfully prepared, including printing of white light-emitting characters, large area coating, white light-emitting lights by coating on a UV-LED surface, and others. This research achieved the development of materials which emit white light with high quality using only an extremely simple operation, namely, mixing of a small amount of solid dyes in the nonvolatile, blue light-emitting liquid. This liquid material can be coated on substrate surfaces with various shapes, and thus is expected to enable broad simplification of the manufacturing processes for lighting devices and other products. Because the emitted color can be controlled with a high brightness, and liquids that display full-color light emission can also be prepared easily, this material is expected to become a new light-emitting material for next-generation printable electronics.

http://news.discovery.com/animals/birds-dinosaurs-120530.html#mkcpgn=rssnws1

Modern Birds Are Really Baby Dinosaurs

Analysis by Jennifer Viegas

Modern birds retain the physical characteristics of baby dinosaurs, according to a new Nature study that found birds are even more closely related to dinos than previously thought.

Depending on the non-avian dinosaur and bird compared, that might be hard to believe. A toothy, angry reconstruction of Tyrannosaurus rex, for example, on first glance looks little like a common garden blue jay.

When researchers go beyond the surface to the tissue and skull levels, however, the similarities become more obvious.

Harvard University's Arkhat Abzhanov, associate professor of organismic and evolutionary biology, and Bhart-Anjan Bhullar, a Ph.D. student in Abzhanov laboratory and the first author of the study, did just that and found evidence that the evolution of birds is the result of a drastic change in how dinosaurs developed.

Bottom image: Velociraptor scavenging the carcass of a pterosaur. **Credit: Brett Booth.**

Rather than take years to reach sexual maturity, as many dinosaurs did, birds sped up the clock (some species take as little as 12 weeks to mature), allowing them to lock into their baby dinosaur look.
"What is interesting about this research is the way it illustrates evolution as a developmental phenomenon," Abzhanov was quoted as saying in a press release. "By changing the developmental biology in early species, nature has produced the modern bird - an entirely new creature - and one that, with approximately 10,000 species, is today the most successful group of land vertebrates on the planet."
"The evolution of the many characteristics of birds - things like feathers, flight, and wishbones - has traditionally been a difficult problem for biologists," Mark Norell, chair of the division of paleontology at the American Museum of Natural History and one of the paper's co-authors, added.
"By analyzing fossil evidence from skeletons, eggs, and soft tissue of bird-like dinosaurs and primitive birds, we've learned that birds are living theropod dinosaurs, a group of carnivorous animals that include Velociraptor," Norell continued. "This new work advances our knowledge by providing a powerful example of how developmental changes played a major role in the origin and evolution of birds."
The next time you bird-watch, keep in mind that our modern feathered friends are all related to the meat-loving Velociraptor.

http://www.bbc.co.uk/news/health-18258775

Gonorrhoea becoming untreatable, health experts warn

By James Gallagher Health and science reporter, BBC News

The number of newly diagnosed cases of gonorrhoea in England soared by 25% in 2011 amid fears that the sexual infection is becoming untreatable.

There have been cases in Japan and Europe of infections that resist first-choice therapies.
The Health Protection Agency said the threat of gonorrhoea was "very concerning".
It said there was a 2% overall rise in the number of new sexually transmitted infections diagnosed in 2011.
Gonorrhoea is caused by bacteria and can result in infertility. It is treated by antibiotics, but some are failing.
The head of sexually transmitted infection surveillance at the HPA, Dr Gwenda Hughes, said: "We are very concerned. It is a global problem.
"[The gonorrhoea bacterium] is very successful at developing resistance to every treatment used in the past few decades.
"We are worried that in the next five years, or some point in the future, that this is going to be a very difficult infection to treat."
Even the most resistant forms of the disease are not yet untreatable.
Professor Cathy Ison, a gonorrhoea expert at the HPA, said that in the past, when resistance emerged, a new drug would be used.
However, she warned: "We don't have a new drug."

Cases rising again

Between 2009 and 2010, the number of new sexually transmitted infections being diagnosed fell for the first time in more than a decade.
However, cases have since increased, with nearly 427,000 new infections diagnosed in 2011.
More accurate tests and more people being tested explain some of the rise.
But the HPA said it was concerned about "ongoing, unsafe sexual behaviour" in at-risk groups.
Dr Hughes said two groups - young adults and men who have sex with men - were of particular concern.
There was a 4% drop in the number of diagnoses of chlamydia in young adults. However, this has been attributed to fewer people getting screened.
Sexually active people under 25 are advised to be checked annually or when they have a change of sexual partner. Yet the number of tests fell from 2.3 million to 2.1 million between 2010 and 2011.
The government said too many people were not taking care of their sexual health.
A Department of Health spokesperson said: "Sexually transmitted infections can lead to infertility and other serious health problems. The message is clear: whatever your age, you should always use a condom."
Lisa Power, from sexual-health charity the Terrence Higgins Trust, said: "These figures must act as a wake-up call, not only to sexually active people but also to the government and public-health services.
"They represent a step backwards for the nation's sexual health. The emergence of drug-resistant strains of gonorrhoea is just one consequence of continued high rates."

http://phys.org/news/2012-05-zircon-crystals-reveal-onset-plate.html

Zircon crystals reveal onset of plate tectonics

We're familiar with the theory that the Earth's crust is composed of tectonic plates that move, until recently nobody knew how long this movement has been going on.

Phys.org - We're familiar with the theory that the Earth's crust is composed of tectonic plates that move, sometimes dramatically to create earthquakes and tsunamis - but until recently, nobody knew how long this movement has been going on. An international team of researchers, including Dr. Anthony Kemp from The University of Western Australia, believes they have found out and their work is published in Nature today.

Dr. Kemp, an Australian Research Council Future Fellow in UWA's School of Earth and Environment, said as far as we know, Earth is the only planet in the solar system with active plate tectonics.

"The purpose of this study was to examine the earliest rock record to find out when plate tectonics started and when the continental crust began to form," he said. "We analyzed zircon crystals from ancient rocks of Greenland. These rocks included some of the oldest and best-preserved parts of the Earth's crust and were between 2.85 and 3.9 billion years old.

"In much the same way that tree rings record the growth of a tree, zircons provide important insights into the nature and composition of the magma (molten material deep within the Earth's crust) from which the zircon crystallised."

The researchers analyzed the isotopes of oxygen and hafnium in the zircon to learn more about the crystals' growth bands and discovered that the Greenland crust had evolved in two stages. The first involved a simple re-melting of 3.9 billion year-old rocks, followed by a second more complex period after about 3.2 billion years ago involving more diverse magma sources associated with re-melting and the formation of new continental material.

"We attribute this transition to the onset of plate tectonics at approximately 3.2 billion years ago and infer that significant volumes of crust began to be stabilized as continents only after that time," Dr. Kemp said.

"We're now trying to verify and extend these findings by studying rocks from the Pilbara, which span the same key time period from 2.8 to 3.6 billion years ago. A broader aim is to identify the triggers for plate tectonics.

"High-precision isotope measurements will be done at the Advanced Geochemistry and Mass Spectrometry Facility recently established at UWA by Winthrop Professor Malcolm McCulloch."

The project was led by Dr. Tomas Naeraa from the Geological Survey of Denmark and Greenland, and also involved researchers from Sweden and Germany.

http://www.eurekalert.org/pub_releases/2012-05/babs-hbo053112.php

Health benefits of vitamin D dependent on type taken

New research funded by the Biotechnology and Biological Sciences Research Council (BBSRC) has shown that vitamin D3 supplements could provide more benefit than the close relative vitamin D2.

The findings published in the June edition of the American Journal of Clinical Nutrition could potentially lead to changes in the food industry when it comes to fortification.

Vitamin D is important for bone and muscle health and there is concern that we don't get enough of the 'sunshine' vitamin through exposure to sunlight or through diet. As a result, some foods are fortified with vitamin D. Fortification is usually with vitamin D2, as this is not derived from animals. However this new research, carried out by scientists from the University of Surrey, suggests that vitamin D3 is the more beneficial of the two types of vitamin D in raising the vitamin D levels in our blood when given as a supplement.

The research clearly showed that vitamin D3, the type of vitamin D found in foods including eggs and oily fish, is more effectively converted by the body into the hormone responsible for health benefits in humans.

Dr Laura Tripkovic, who led the study, explains: "We know that vitamin D is vital in helping to keep us fit and healthy, but what has not been clear is the difference between the two types of vitamin D. It used to be thought that both were equally beneficial, however our analysis highlights that our bodies may react differently to both types and that vitamin D3 could actually be better for us."

The researchers analysed the results of 10 separate studies, involving over 1,000 people in total, comparing the health benefits of vitamin D2 and D3, and found "a clear favouring" of vitamin D3 supplements raising vitamin D serum levels in humans.

The researchers are now conducting a further study to see if the same results are found when using lower doses of vitamin D2 and vitamin D3 added to foods, rather than given as stand-alone supplements. Dr Tripkovic and her team will look at over 300 people to find out if vitamin D3 is better, and if so why this is the case. They will

also look at how gender, ethnicity and genetic make-up may play a role in how our bodies use both types of vitamin D.

Professor Douglas Kell, BBSRC Chief Executive, said: "With a growing and ageing population, this kind of research is vital to help us ensure that as many people as possible are able to stay healthy and active as they get older. This is a clear example of how a greater understanding of the basic bioscience underpinning human health, could lead to an increase in healthspan to match our increase in lifespan."

***'Comparison of vitamin D2 and vitamin D3 supplementation in raising serum 25-hydroxyvitaminD status: a systematic review and meta-analysis**, AJCN: 2012 95:1357-1364 is available to download from: http://www.ajcn.org/content/95/6.toc*

http://www.eurekalert.org/pub_releases/2012-05/rb-aj053112.php

'Like a jet through solid rock': Volcanic arc fed by rapid fluid pulses

In the Chinese Tian Shan Mountains, fluids pushed their way to the earth's mantle from great depths in just 200 years rather than in the course of tens or even hundreds of thousands of years.

In the depths of the earth, it is anything but peaceful: large quantities of liquids carve their way through the rock as fluids, causing magma to form. A research team led by the University of Münster, has shown that the fluids flow a lot faster through solid rock than previously assumed. In the Chinese Tian Shan Mountains, fluids pushed their way to the earth's mantle from great depths in just 200 years rather than in the course of tens or even hundreds of thousands of years. The researchers from Münster, Kiel, Bochum, Erlangen, Bethlehem (USA) and Lausanne (Switzerland) present their findings, based on an innovative combination of fieldwork, geochemical analysis and numerical calculations, in the current issue of the journal Nature Geoscience. The RUB geoscientists are experts in determining time scales using numerical models.

How the "Ring of Fire" is formed

When tectonic plates move towards each other and push over each other at the edges, so-called subduction zones are formed. The descending plate is heated and continuously releases the water stored in its rocks as fluid. The fluid penetrates the earth's mantle, which is located above the descending plate. The fluids thus lower the melting point of the mantle rocks, and the liquid rock formed rises to the volcanoes as magma. This magma feeds the many volcanoes throughout the world that occur along the convergent plate boundaries and form the "Ring of Fire", a volcanic belt that encircles the Pacific Ocean. The fluids are commonly assumed to flow through the rock in a defined flow system. Geologists call these structures veins.

Only two hundred years

During field work in the Chinese part of the Tian Shan Mountains (Celestial Mountains), the research team found structures in the rocks they were studying which can be ascribed to massive fluid flows at great depth. "Our investigation has shown that a great deal of fluid must have flowed through a rock vein at about 70 km depth and that this fluid has obviously already covered a distance of several hundred meters or more - the transport of such large quantities of fluid over such a great distance has not been demonstrated by anyone before us" explains Timm John from the Institute for Mineralogy, University of Münster. "And the most exciting thing is that this amount of fluid flowed through the rock in what is for geological processes a very short time, only about two hundred years", adds Nikolaus Gussone of the same institute.

Like in a reservoir

The release of fluids from minerals in the descending plates is a large-scale and continuous process that takes place at depths up to two-hundred kilometres and takes millions of years. During this time, the fluids first accumulate. As the researchers have now shown for the first time, the released fluids then flowed through the plate on their way to the mantle in pulses in a relatively short time along defined flow paths. "It's like a reservoir that continuously fills and then empties in a surge through defined channels" Timm John points out. "The fluid release is focused in space and time, and is much faster than expected - almost like a jet through solid rock". The researchers hope to be able to show the spatial and temporal correlations between such fluid pulses and volcanic activity in future studies. It is also possible that such focused fluid releases are associated with the occurrence of earthquake events in subduction zones. To be able to demonstrate such relations, however, intensive research is still needed.

RUB experts for time scales

The RUB's petrologists were involved in modelling the chemical data. This enabled the research team to determine the time it took the fluids to make their way to the mantle. Determining the time scales of various geological processes is a particular expertise of Bochum's petrologists. Among other things, they use minerals and rocks with zones that exhibit a different chemical composition.

T. John et al. (2012): Volcanic arcs fed by rapid pulsed fluid flow through subducting slabs. Nature Geoscience, doi: 10.1038/NGEO1482

http://www.eurekalert.org/pub_releases/2012-05/taac-ita053112.php

Is there a 'healthy' obesity gene?

Researchers investiogate how gene may benefit some obese people

COLLEGE STATION – Why is it that some obese people are healthier than others? This was one of the main questions Dr. Chaodong Wu of the College of Agriculture and Life Sciences - Texas A&M University System - and a group of researchers tried to answer in a recent study. The study, which will appear in a July issue of the Journal of Biological Chemistry, used genetically modified mice to investigate the genetic aspects of why some obese people do not develop certain medical problems typically associated with obesity, especially Type 2 diabetes.

Wu noted that Xin Guo, a Ph.D. candidate in the college's department of nutrition and food sciences, contributed significantly to the study. "Previous research had indicated that a regulatory enzyme which is encoded by the gene PFKFB3 protects against diet-induced fat tissue inflammation and systemic insulin resistance," said Wu, who also has a Texas AgriLife Research appointment. "Increasing evidence shows that fat deposition, or amount, is not directly associated with the inflammation or insulin resistance in the development of obesity-related metabolic diseases."

Wu said the inducible 6-phosphorofructo-2-kinase (iPFK2) enzyme links metabolic and inflammatory responses and may underlie what he refers to as "healthy" obesity. "While many obese people develop Type 2 diabetes, heart conditions and other chronic health problems associated with being significantly overweight, other obese people do not," he said. "And while obesity in general is not healthy, some obese people do not develop the diseases more commonly associated with a less-than-healthy diet. Furthermore, a number of thinner people may have the sort of health problems more typically associated with obesity."

Wu said he and the other researchers theorized that these diseases are associated with the cellular inflammatory response brought on by obesity. "We also thought this gene could conceivably be targeted for use in the treatment of diabetes, especially Type 2, commonly associated with obesity," he said. "We wanted to find out what might happen to a subject if that particular gene was activated."

Wu and his fellow researchers used laboratory mice to explore the effect of a targeted adipocyte overexpression of the gene/enzyme combination on diet-induced inflammatory responses and insulin sensitivity.

"We were trying to find out what it is in adipose, or fat, tissue that may trigger a negative response that leads to disease - and how to modulate that response," he said. "In our study, we learned overexpression of the iPFK2 enzyme increases fat deposition, suppresses inflammatory responses and improves insulin sensitivity in both adipose and live tissues."

As an extension of this research, Wu said, it may be possible to identify a pharmacological agent or bioactive agent which may have the desired effect on this gene toward reducing obesity-related cellular inflammatory response.

"We're hoping that, as one of its outcomes, this research will help lead to finding bioactive compounds or some type of supplement that might be taken to help activate this gene toward the promotion of health," he said. "It would also be a good idea to compare and contrast this research with studies done on what constitutes a healthy diet and the effect of such a diet at a cellular level. "

Wu said that would allow for screening bioactive compounds in a healthy diet to determine to what degree these might be applicable for the treatment of disease brought on by unhealthy obesity in an animal model.

"As a further extension, one might study different types of obese people and try to isolate additional specific genes that determine a healthy versus an unhealthy obesity and find a way to modulate the expression of those genes toward disease prevention and health promotion," he said. "Once you find the link between the gene and the obese status of the individual, then you could work with experts in chemical research to produce or replicate whatever pharmacological or bioactive compound is needed to treat unhealthy obesity."

Wu said it is important to determine positively to what degree obesity as a health problem is due to a person's genetic makeup as it relates to their ability to store fat, as well as what type of fat – saturated or non-saturated – the individual may store.

"Fat composition is more important than fat deposition, or content," he said. "We know fat cells secrete some of their own bioactive compounds that we may be able to isolate and identify for use in promoting health."

Wu said it will be necessary to discover the role of certain genes in the composition and deposition of fats beyond what has already been identified as being stored in the adipose tissue of mice.

"Then we may be able to produce a dietary supplement or other bioactive compound that would have a positive health effect," he said. "This could be used as a targeted treatment for obesity-related diseases such as Type 2 diabetes in a way that would have limited or minimal side effects."

http://www.eurekalert.org/pub_releases/2012-05/bmj-dcc053012.php

Dark chocolate could prevent heart problems in high-risk people

Daily consumption over 10 years is a cost-effective strategy

Daily consumption of dark chocolate can reduce cardiovascular events, such as heart attacks and strokes, in people with metabolic syndrome (a cluster of factors that increases the risk of developing heart disease and diabetes), finds a study published on bmj.com today.

Cardiovascular disease is the leading cause of death worldwide. Dark chocolate (containing at least 60% cocoa solids) is rich in flavonoids - known to have heart protecting effects - but this has only been examined in short term studies. So a team of researchers from Melbourne, Australia used a mathematical model to predict the long-term health effects and cost effectiveness of daily dark chocolate consumption in 2,013 people already at high risk of heart disease. All participants had high blood pressure and met the criteria for metabolic syndrome, but had no history of heart disease or diabetes and were not on blood pressure lowering therapy.

With 100% compliance (best case scenario), the researchers show that daily dark chocolate consumption could potentially avert 70 non-fatal and 15 fatal cardiovascular events per 10,000 people treated over 10 years.

Even when compliance levels were reduced to 80%, the number of non-fatal and fatal events potentially averted was 55 and 10 per 10,000 people treated over 10 years, and could still be considered an effective intervention strategy. The model also suggested that $A40 (£25; €31; $42) could be cost effectively spent per person per year on dark chocolate prevention strategies and could be used for advertising, educational campaigns, or subsidising dark chocolate in this high risk population, they add.

The authors stress that only non-fatal stroke and non-fatal heart attack were assessed in their analysis, and that the potential effects on other cardiovascular events, such as heart failure, are yet to be tested. Also important, they say, is that these protective effects have only been shown for dark chocolate (at least 60-70% cocoa), rather than for milk or white chocolate, probably due to the higher levels of flavonoids found in dark chocolate.

Nevertheless, they conclude that the blood pressure and cholesterol lowering effects of plain dark chocolate "could represent an effective and cost effective strategy for people with metabolic syndrome (and no diabetes)."

http://www.eurekalert.org/pub_releases/2012-05/uota-vsa053012.php

Vertebrates share ancient neural circuitry for complex social behaviors, biologists find

Humans, fish and frogs share neural circuits responsible for a diversity of social behavior, from flashy mating displays to aggression and monogamy

AUSTIN, Texas - Humans, fish and frogs share neural circuits responsible for a diversity of social behavior, from flashy mating displays to aggression and monogamy, that have existed for more than 450 million years, biologists at The University of Texas at Austin found.

"There is an ancient circuitry that appears to be involved in social behavior across all vertebrates," said Hans Hofmann, associate professor of integrative biology. "On a basic level, this tells us something about where we came from. A lot of the neural circuits that our brain uses for social behavior are actually quite old."

Hofmann and graduate student Lauren O'Connell published their research in this week's Science.

The biologists analyzed 12 regions of the brain responsible for social behavior and decision-making in 88 species of vertebrates including birds, mammals, reptiles, amphibians and fish.

They specifically looked at gene activity in two neural networks, one responsible for evaluating the relative importance of stimuli (the mesolimbic reward system), and one responsible for social behavior (the social behavior network). The former is important in drug addiction and romantic love, which manifests in the brain surprisingly like drug addiction.

"In these key brain regions, we found remarkable conservation of gene activity across species," said Hofmann. Despite the discovery of such consistency in gene activity, it's easy to see that vertebrates have evolved a large diversity of behaviors during the past 450 million years.

That diversity can be partly explained, said Hofmann, as small variations on a theme. The basic neural circuits evolved long ago, providing a genetic and molecular framework for the evolution of new behavior. Small tweaks over time in those neural circuits then give rise to new behavior.

Monogamy, for example, has evolved multiple times independently in various vertebrate species. Monogamous behavior can be more advantageous for reproduction and survival under certain environmental conditions, and the research suggests that the evolution of this behavior is probably the result of small tweaks in a conserved neural network rather than evolving an entirely new one.

"Vertebrate brains are incredibly diverse, but we are finding the commonalities, even at the level of gene activity," said Hofmann. "Now we have a framework with which we can ask whether there are molecular universals associated with social behaviors."

Hofmann described "molecular universals" as common genes and molecules shared across species that form the bases of behavior, and he is on the hunt for them. This research highlights the areas of the vertebrate brain where he can now look for molecular universals in these shared neural circuits.

http://www.eurekalert.org/pub_releases/2012-05/uov-mls053112.php

Monkey lip smacks provide new insights into the evolution of human speech

Scientists have traditionally sought the evolutionary origins of human speech in primate vocalizations, such as monkey coos or chimpanzee hoots.

But unlike these primate calls, human speech is produced using rapid, controlled movements of the tongue, lips and jaw. Speech is also learned, while primate vocalizations are mostly innately structured. New research published in Current Biology by W. Tecumseh Fitch, Head of the Department of Cognitive Biology at the University of Vienna, supports the idea that human speech evolved less from vocalizations than from communicative facial gestures.

Researchers at Princeton and the University of Vienna used x-ray movies to investigate lip-smacking gestures in macaque monkeys. Lip smacks are made by many monkey species in friendly, face-to-face situations (e.g. between mothers and their infants). Although lip-smacking makes a quiet sound (similar to "p p p p"), it is not accompanied by phonation, which is produced by vocal cord vibration in the "voice box" or larynx.

Although superficially lip-smacking appears to involve simply rapid opening and closing of the lips, the x-ray movies show that lip-smacking is actually a complex behaviour, requiring rapid, coordinated movements of the lips, jaw, tongue and the hyoid bone (which provides the supporting skeleton for the larynx and tongue). Furthermore these movements occur at a rate of about 5 cycles per second, the same as speech, and are much faster than chewing movements (about 2.5 cycles per second). Thus, although lip smacking superficially resembles "fake chewing", it is in fact very different, and more like speech.

Fascinating facial signals

These observations support a long-standing hypothesis of Peter MacNeilage and his colleagues that the roots of human speech do not lie in primate vocalizations, but are closer to these fascinating facial signals used for communication by monkeys. In particular, the alternation between vowel and consonant that generates speech syllables is strikingly similar to the movements underlying lip-smacking.

Intriguingly, chimpanzees also make communicative sounds with their lips, including both loud lip smacks and lip buzzes ("raspberries"). These lip gestures appear to be under voluntary control, and can be learned (unlike hoots or grunts). Similarly, orangutans can learn to whistle: again a sound produced using the lips and tongue, rather than the larynx.

Together, these data from our primate cousins support the idea that the origins of speech might be found in an evolutionary combination of "traditional" phonation (sounds produced by the vocal cords, in the larynx) with rapid, learned movements of the vocal tract, which have stronger similarities to primate facial signals than to their innate calls. But the origin of the "singing" component of speech, which requires voluntary control over the larynx, remains mysterious.

Publication in Current Biology: Cineradiography of Monkey Lip-smacking Reveals Putative Precursors of Speech Dynamics: Asif A. Ghanzanfar, Daniel Y. Takahashi, Neil Mathur and W. Tecumseh Fitch. Current Biology, July 10, 2012 print issue. DOI: 10.1016/

http://bit.ly/LbGwBr

Rehab robot helps paralysed rats walk again

Rats paralysed by severe spinal cord injuries have recovered the ability to walk, sprint and even climb stairs, thanks to a rehabilitating robot and a chocolate treat.

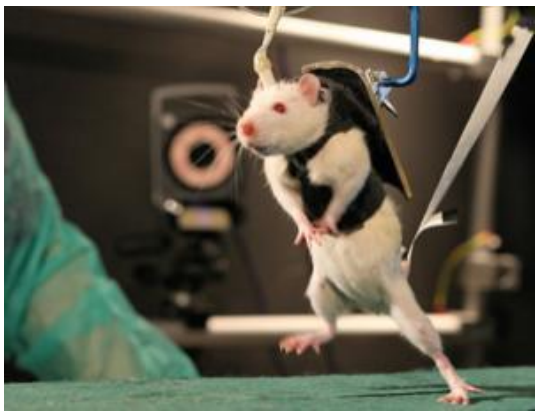
19:01 31 May 2012 by Jacob Aron

Grégoire Courtine at the Swiss Federal Institute of Technology in Lausanne, Switzerland and colleagues previously restored movement to rats with spinal injuries similar to those causing lower-body paralysis in humans, by using a cocktail of chemicals and direct stimulation of spinal nerves.

The team injected chemicals similar to those released in a healthy rat by the brainstem pathways that activate nerves controlling lower body movement. The team then stimulated the spinal cord using electrodes which send a continuous electrical signal to nerves that control rhythmic leg movement. This allowed the animals to walk supported on a treadmill just one week after their injury. "That looks great, but it is completely involuntary," says Courtine.

Now his team have replaced the treadmill with a robotic harness that holds the rat up on its hind legs, supporting it when it falls over but otherwise allowing it to stand and move independently – Courtine compares it to being held on either side by a pair of burly men.

They also added a chocolate treat just out of reach of the rats. This encouraged each rat to send messages from its brain to its legs, willing them to move. This top-down motivation appeared to kick-start the spinal nerves' growth. After two to three weeks the rats were able to make their first voluntary steps. A further few weeks saw the rats walking voluntarily on their hind legs for extended periods of time.



Rat walk: Electrodes stimulated the spinal nerves **Image: courtesy of EPFL**

More nerve fibres

The rats saw a four-fold increase in nerve fibres throughout their brain and spine, with the new fibres bypassing the original injury and allowing signals from the brain to reach the spine. In comparison, rats given the same chemical and electrical treatment but trained on a treadmill were unable to move voluntarily as there was no regrowth of nerve fibres.

Courtine plans to begin human trials of the technique in the next two years. "We have huge cognitive capacity to invest, and the desire to recover is stronger than a rat, so the recovery may be more extensive. That's my feeling," he says, though he stresses that the treatment works best on recent, rather than long-standing, injuries.

"It is a determined attempt to see whether electrical and chemical means can enhance the formation of new functional connections among non-damaged fibres in rats, with implications for the same procedure in clinical trials," says Geoffrey Raisman, who researches spinal repair at University College London.

It is not yet clear, however, whether the new, bypassing nerve fibres can completely restore motor function, he adds. "We don't know to what extent this would be limited by the fact that the original connections are still lost." *Journal reference: Science, DOI: 10.1126/science.1217416*

http://www.eurekalert.org/pub_releases/2012-06/wkh-hde060112.php

How does exercise affect nerve pain?

Experiments show exercise-related reductions in neuropathic pain and inflammatory mediators

San Francisco, CA. - Exercise helps to alleviate pain related to nerve damage (neuropathic pain) by reducing levels of certain inflammation-promoting factors, suggests an experimental study in the June issue of Anesthesia & Analgesia, official journal of the International Anesthesia Research Society (IARS).

The results support exercise as a potentially useful nondrug treatment for neuropathic pain, and suggest that it may work by reducing inflammation-promoting substances called cytokines. The lead author was Yu-Wen Chen, PhD, of China Medical University, Taichung, Taiwan.

Exercise Reduces Nerve Pain and Cytokine Expression in Rats

Neuropathic pain is a common and difficult-to-treat type of pain caused by nerve damage, seen in patients with trauma, diabetes, and other conditions. Phantom limb pain after amputation is an example of neuropathic pain.

Dr Chen and colleagues examined the effects of exercise on neuropathic pain induced by sciatic nerve injury in rats. After nerve injury, some animals performed progressive exercise - either swimming or treadmill running - over a few weeks. The researchers assessed the effects of exercise on neuropathic pain severity by monitoring observable pain behaviors. The results suggested significant reductions in neuropathic pain in rats assigned to swimming or treadmill running. Exercise reduced abnormal responses to temperature and pressure - both characteristic of neuropathic pain.

Exercise also led to reduced expression of inflammation-promoting cytokines in sciatic nerve tissue - specifically, tumor necrosis factor-alpha and interleukin-1-beta. That was consistent with previous studies suggesting that inflammation and pro-inflammatory cytokines play a role in the development of neuropathic pain in response to nerve injury.

Exercise also led to increased expression of a protein, called heat shock protein-27, which may have contributed to the reductions in cytokine expression. Neuropathic pain causes burning pain and numbness that is not controlled by conventional pain medications. Antidepressant and antiepileptic drugs may be helpful, but have significant side effects. Exercise is commonly recommended for patients with various types of chronic pain, but there are conflicting data as to whether it is helpful in neuropathic pain.

The new results support the benefits of exercise in reducing neuropathic pain, though not eliminating it completely. In the experiments, exercise reduced abnormal pain responses by 30 to 50 percent.

The study also adds new evidence that inflammation contributes to the development of neuropathic pain, including the possible roles of pro-inflammatory cytokines. The results provide support for exercise as a helpful, nondrug therapy for neuropathic pain—potentially reducing the need for medications and resulting side effects.

http://www.eurekalert.org/pub_releases/2012-06/sri-sse060112.php

Study suggests expanding the genetic alphabet may be easier than previously thought

A new study suggests that the replication process for DNA is more open to unnatural letters than had previously been thought.

LA JOLLA, CA – A new study led by scientists at The Scripps Research Institute suggests that the replication process for DNA - the genetic instructions for living organisms that is composed of four bases (C, G, A and T) - is more open to unnatural letters than had previously been thought. An expanded "DNA alphabet" could carry more information than natural DNA, potentially coding for a much wider range of molecules and enabling a variety of powerful applications, from precise molecular probes and nanomachines to useful new life forms.

The new study, which appears in the June 3, 2012 issue of Nature Chemical Biology, solves the mystery of how a previously identified pair of artificial DNA bases can go through the DNA replication process almost as efficiently as the four natural bases.

"We now know that the efficient replication of our unnatural base pair isn't a fluke, and also that the replication process is more flexible than had been assumed," said Floyd E. Romesberg, associate professor at Scripps Research, principal developer of the new DNA bases, and a senior author of the new study. The Romesberg laboratory collaborated on the new study with the laboratory of co-senior author Andreas Marx at the University of Konstanz in Germany, and the laboratory of Tammy J. Dwyer at the University of San Diego.

Adding to the DNA Alphabet

Romesberg and his lab have been trying to find a way to extend the DNA alphabet since the late 1990s. In 2008, they developed the efficiently replicating bases NaM and 5SICS, which come together as a complementary base pair within the DNA helix, much as, in normal DNA, the base adenine (A) pairs with thymine (T), and cytosine (C) pairs with guanine (G).

The following year, Romesberg and colleagues showed that NaM and 5SICS could be efficiently transcribed into RNA in the lab dish. But these bases' success in mimicking the functionality of natural bases was a bit mysterious. They had been found simply by screening thousands of synthetic nucleotide-like molecules for the ones that were replicated most efficiently. And it had been clear immediately that their chemical structures lack the ability to form the hydrogen bonds that join natural base pairs in DNA. Such bonds had been thought to be an absolute requirement for successful DNA replication —a process in which a large enzyme, DNA polymerase, moves along a single, unwrapped DNA strand and stitches together the opposing strand, one complementary base at a time.

An early structural study of a very similar base pair in double-helix DNA added to Romesberg's concerns. The data strongly suggested that NaM and 5SICS do not even approximate the edge-to-edge geometry of natural base pairs—termed the Watson-Crick geometry, after the co-discoverers of the DNA double-helix. Instead, they join in a looser, overlapping, "intercalated" fashion. "Their pairing resembles a 'mispair,' such as two identical bases together, which normally wouldn't be recognized as a valid base pair by the DNA polymerase," said Denis Malyshev, a graduate student in Romesberg's lab who was lead author along with Karin Betz of Marx's lab.

Yet in test after test, the NaM-5SICS pair was efficiently replicable. "We wondered whether we were somehow tricking the DNA polymerase into recognizing it," said Romesberg. "I didn't want to pursue the development of applications until we had a clearer picture of what was going on during replication."

Edge to Edge

To get that clearer picture, Romesberg and his lab turned to Dwyer's and Marx's laboratories, which have expertise in finding the atomic structures of DNA in complex with DNA polymerase. Their structural data showed plainly that the NaM-5SICS pair maintain an abnormal, intercalated structure within double-helix DNA—but remarkably adopt the normal, edge-to-edge, "Watson-Crick" positioning when gripped by the polymerase during the crucial moments of DNA replication.

"The DNA polymerase apparently induces this unnatural base pair to form a structure that's virtually indistinguishable from that of a natural base pair," said Malyshev.

NaM and 5SICS, lacking hydrogen bonds, are held together in the DNA double-helix by "hydrophobic" forces, which cause certain molecular structures (like those found in oil) to be repelled by water molecules, and thus to cling together in a watery medium.

"It's very possible that these hydrophobic forces have characteristics that enable the flexibility and thus the replicability of the NaM-5SICS base pair," said Romesberg. "Certainly if their aberrant structure in the double helix were held together by more rigid covalent bonds, they wouldn't have been able to pop into the correct structure during DNA replication."

An Arbitrary Choice?

The finding suggests that NaM-5SICS and potentially other, hydrophobically bound base pairs could some day be used to extend the DNA alphabet. It also hints that Evolution's choice of the existing four-letter DNA alphabet—on this planet—may have been somewhat arbitrary. "It seems that life could have been based on many other genetic systems," said Romesberg.

He and his laboratory colleagues are now trying to optimize the basic functionality of NaM and 5SICS, and to show that these new bases can work alongside natural bases in the DNA of a living cell.

"If we can get this new base pair to replicate with high efficiency and fidelity in vivo, we'll have a semi-synthetic organism," Romesberg said. "The things that one could do with that are pretty mind blowing."

The other contributors to the paper, "KlenTaq polymerase replicates unnatural base pairs by inducing a Watson-Crick geometry," are Thomas Lavergne of the Romesberg lab, Wolfram Welte and Kay Diederichs of the Marx lab, and Phillip Ordoukhanian of the Center for Protein and Nucleic Acid Research at The Scripps Research Institute.

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http://bit.ly/Lfy6oE

Vast cosmic event leaves record in ancient trees

The wooden hearts of two cedar trees hold a 1200-year-old cosmic mystery – evidence of an unexplained event that rocked our planet in the 8th century.

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Cosmic rays are subatomic particles that tear through space. When they reach Earth they react with the oxygen and nitrogen in the atmosphere, producing new particles. One of these – carbon-14 – is taken up by trees during photosynthesis and is "fixed" in the tree's annual growth ring.

Fusa Miyake at Nagoya University, Japan, and his colleagues examined the carbon-14 content of two Japanese cedar trees and were surprised to find that there was a 1.2 per cent increase in the amount of the isotope between AD 774 and 775. The typical annual variation is just 0.05 per cent. Miyake also found an increase in the carbon-14 record of North American and European trees around that time, as well as an increase in the isotope beryllium-10 in Antarctic ice cores – another isotope produced by cosmic rays.

What cosmic event led to the ray boost? A supernova would do it, but Miyake points out that such an event would have left a visible trace in today's sky. It could have been a solar flare – but only if the flare was more energetic than any discovered so far.

"I cannot imagine a single flare which would be so bright," says Igor Moskalenko, an astrophysicist at Stanford University, California, who was not involved in the work. "Rather, it may be a series of weaker flares over the period of one to three years."

This is not the first time that tree records have suggested a cosmic event occurred in the mid 770s. Researchers from Queen's University Belfast, UK, also recently found an increase in carbon-14 in tree rings at that time but their work has yet to be published.

Mike Baillie, a tree ring researcher at Queen's, has found evidence in the historical record that suggests something unusual did indeed happen at that time. The 13th-century English chronicler Roger of Wendover is quoted as saying: "In the Year of our Lord 776, fiery and fearful signs were seen in the heavens after sunset; and serpents appeared in Sussex, as if they were sprung out of the ground, to the astonishment of all."

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Future medical conditions predicted with new statistical model

Analyzing medical records from thousands of patients, statisticians have devised a statistical model for predicting what other medical problems a patient might encounter.

Like how Netflix recommends movies and TV shows or how Amazon.com suggests products to buy, the algorithm makes predictions based on what a patient has already experienced as well as the experiences of other patients showing a similar medical history.

"This provides physicians with insights on what might be coming next for a patient, based on experiences of other patients. It also gives a predication that is interpretable by patients," said Tyler McCormick, an assistant professor of statistics and sociology at the University of Washington.

The algorithm will be published in an upcoming issue of the journal Annals of Applied Statistics. McCormick's co-authors are Cynthia Rudin, Massachusetts Institute of Technology, and David Madigan, Columbia University.

McCormick said that this is one of the first times that this type of predictive algorithm has been used in a medical setting. What differentiates his model from others, he said, is that it shares information across patients

who have similar health problems. This allows for better predictions when details of a patient's medical history are sparse.

For example, new patients might lack a lengthy file listing ailments and drug prescriptions compiled from previous doctor visits. The algorithm can compare the patient's current health complaints with other patients who have a more extensive medical record that includes similar symptoms and the timing of when they arise. Then the algorithm can point to what medical conditions might come next for the new patient.

"We're looking at each sequence of symptoms to try to predict the rest of the sequence for a different patient," McCormick said. If a patient has already had dyspepsia and epigastric pain, for instance, heartburn might be next.

The algorithm can also accommodate situations where it's statistically difficult to predict a less common condition. For instance, most patients do not experience strokes, and accordingly most models could not predict one because they only factor in an individual patient's medical history with a stroke. But McCormick's model mines medical histories of patients who went on to have a stroke and uses that analysis to make a stroke prediction.

The statisticians used medical records obtained from a multiyear clinical drug trial involving tens of thousands of patients aged 40 and older. The records included other demographic details, such as gender and ethnicity, as well as patients' histories of medical complaints and prescription medications.

They found that of the 1,800 medical conditions in the dataset, most of them – 1,400 – occurred fewer than 10 times. McCormick and his co-authors had to come up with a statistical way to not overlook those 1,400 conditions, while alerting patients who might actually experience those rarer conditions.

They came up with a statistical modeling technique that is grounded in Bayesian methods, the backbone of many predictive algorithms. McCormick and his co-authors call their approach the Hierarchical Association Rule Model and are working toward making it available to patients and doctors.

"We hope that this model will provide a more patient-centered approach to medical care and to improve patient experiences," McCormick said.

The work was funded by a Google Ph.D. fellowship awarded to McCormick and by the National Science Foundation.

For more information, contact McCormick at 206-221-6981 or tylermc@uw.edu. Download the Annals of Applied Statistics paper from McCormick's website: http://www.stat.washington.edu/~tylermc/