

Mystery of Denim's Origins Solved by Art

An anonymous Italian artist is being dubbed the 'Master of Denim' for his portrayal of the peasant class in the now-famous fabric.

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Workaday staple and fashion favorite, blue jeans have conquered the planet. But were they born in the textile mills of New Hampshire, on France's southern coast or the looms of north Italy?

Art historians believe they have found a piece of the centuries-old puzzle in the work of a newly discovered 17th-century north Italian artist, dubbed the "Master of the Blue Jeans," whose paintings went on show in Paris this week.

Running through his works like a leitmotif is an indigo blue fabric threaded with white, with rips revealing its structure, in the skirts of a peasant woman or the jacket of a beggar boy.

"The works are very attached to the detail of clothing -- it was very rare for a painter to characterize the poor with such detail," said curator Gerlinde Gruber, who helped to identify the anonymous artist's works. "And there is blue jean in every painting except one," she said.

Other details in his work, such as a knotted white kerchief in a painting entitled "Mother Sewing," enabled curators to locate the scenes in northern Italy, in the region of Venice.



An anonymous, 17th-century Italian painting may be one of the first-known depictions of denim, putting to rest the age-old debate as to where the fabric originated. AFP/HO

Historians have long traced jeans' ancestry to two sources outside the United States: a sturdy fabric from the French city of Nimes -- "de Nimes," hence "denim" -- on the one hand, and a cotton fustian from Genoa in Italy -- "Genes" in French, becoming "Jeans" in English -- on the other. But unlike the finery worn by the upper classes, the clothes of the peasant classes were used until shredded through, leaving no trace.

Until now there were only fragmented written records to rely on to document the shipments of low-cost fabric that flooded from Genoa into northern Europe -- and especially England -- in the mid-17th century.

"We have accounts from an English tailor saying that his fabric came from Genoa, and that is the origin of jeans," said Gruber. "But this gives us new documentary proof of a historical reality that has been forgotten."

In a further quirk, the blue tint of the fabric was painted with the exact same indigo as that used to dye today's denim, according to curators.

Centuries later, husband and wife design team Francois and Marithe Girbaud earned a reputation as modern-day masters of the jeans world -- as pioneers of the baggy hip-hop look, of stonewashing or stretch denim.

"This calls into question the entire history we have been telling up until now," said Francois Girbaud, who partnered with the Paris exhibition. "And that's what's fun."

"In people's minds, jeans used to be all about Marilyn Monroe, James Dean, about the United States," he said. "Nimes or Genoa? I don't have the answer. But it's amusing to think that jeans already existed in 1655."

Ten paintings have been attributed to the Italian artist, eight of which are on show in Paris alongside works by contemporaries such as Michael Sweerts or Giacomo Ceruti, loaned from museums and private collections in Rome and Vienna. How they came together in Paris is a detective story in itself.

In 2004, the Paris-based gallery owner Maurizio Canesso bought a work in New York by an unknown artist of the Neapolitan school. Trying to track down the origins of the painting, "The Barber's Shop," Canesso found a copy in a museum in Varese near Milan and says "that was when the search really began."

At the same time in Italy, unknown to him, Gruber had been joining the dots between works she believed to be by the same artist, who she dubbed "The Master of the Blue Jeans" because of the recurring presence of the fabric.

Her search began after two works thought to be by his hand surfaced within a short space of time -- the "Woman sewing with two children" and the "Beggar boy with a piece of pie."

Canesso's curiosity was aroused by a 2006 article in which Gruber described the paintings, and over the following few years he purchased all the available works attributed to the artist.

With their use of vivid blue set against chiraoscuro backdrops, and focus on humble everyday scenes, the works' value is estimated at between \$90,000 and \$1.25 million according to the Canesso gallery.

Scientists uncover process enabling toxoplasmosis parasite to survive homelessness

INDIANAPOLIS — The parasite responsible for toxoplasmosis requires a stress response system that helps it survive the move to infect new cells, Indiana University School of Medicine scientists have reported, a discovery that could lead to new treatments to control the disease.

Parasites such as *Toxoplasma gondii* invade host cells, replicate and then must exit to find new host cells to invade. Traveling outside their host cell exposes the parasites to environmental stresses that limit how long they can remain viable while searching for new host cells.

The researchers found that the parasite triggers a stress response mechanism that alters protein production through phosphorylation of a factor called eIF2, which the *Toxoplasma* parasite uses to survive periods when it finds itself without a host cell. Phosphorylation is a cellular process in which a phosphate compound is added to a protein to alter its activity.

"*Toxoplasma* does not like to be homeless," said William J. Sullivan Jr., Ph.D., associate professor of pharmacology and toxicology. "Being deprived of the nutrients and shelter provided by the host cell is a serious stress on the parasite. Our research uncovered a critical pathway the parasite uses to survive the journey from one host cell to another."

The report is being published this week in the online early edition of the Proceedings of the National Academy of Sciences. In addition to Sullivan, the researcher team included Ronald C. Wek, Ph.D., professor of biochemistry and molecular biology; lead author and postdoctoral fellow Bradley Joyce, Ph.D., and Sherry F. Queener, Ph.D., professor of pharmacology and toxicology.

Based on earlier research, the group previously reported that the same response system is employed by the parasite when its host cell is stressed, which enables *Toxoplasma* to transform into a cyst surrounded by a protective barrier that can resist drugs and the body's immune system. Later, however, the parasite can emerge from its dormant state to strike when a patient's immune system is weakened.

"Our latest findings indicate that if we design new drugs that target this stress response pathway, these drugs may be effective against both acute and chronic *Toxoplasma* infection," says Dr. Sullivan.

An estimated 60 million people in the United States are infected with the toxoplasmosis parasite, but for most infection produces flu-like symptoms or no symptoms at all. However, for people with an impaired immune system – such as those undergoing chemotherapy, heart transplants, or people with AIDS – the disease can cause life-threatening complications including cardiopulmonary problems, blurred vision and seizures. Also, if a woman becomes infected for the first time shortly before or during pregnancy, there is risk of miscarriage or congenital birth defects.

Support for this research was provided through grants from the American Heart Association and the National Institutes of Health.

Swallowing disc batteries can cause severe injury in children

Severe injury to the esophagus can occur after a child swallows a disc battery, according to a report in the September issue of Archives of Otolaryngology–Head & Neck Surgery, one of the JAMA/Archives journals.

"A disc battery is an increasingly common foreign body ingested by children," the authors write as background information in the article. The American Association of Poison Control Centers reported a total of 2,063 disc battery ingestions in 1998; the number increased 80 percent during the next eight years. When the battery is lodged in the esophagus, its alkaline contents can leak, causing tissue death and burns from electrical discharge.

Stanley J. Kimball, D.O., of Mount Carmel Health System, Columbus, Ohio, and colleagues reviewed the medical charts of 10 pediatric patients who underwent endoscopic retrieval of a swallowed disc battery over a 10-year period between 1998 and 2008. The children were an average age of 3.2 years, four were female and six were male. A chest X-ray was taken for each patient and one also underwent a chest computed tomographic (CT) scan.

"Five patients had an observed ingestion or were found coughing," the authors write. "Two patients complained of a sore throat and self-reported foreign body ingestion. Three patients were diagnosed incidentally via chest radiograph (two exhibited persistent upper respiratory tract symptoms, and one had the foreign body discovered during a workup for chest and back pain after falling off her bike)."

The children stayed in the hospital for an average of 6.9 days, with a range of one to 30 days. Six patients were seen within six hours of ingesting the battery, one after 10 hours and one after 12 hours; two patients had a substantial delay in discovery of the battery, one for seven days and one for 30 days.

Three patients had minimal damage to the esophagus, including one with no injury and two with superficial injuries to the mucus membrane. The other seven patients had more severe damage, with five sustaining damage to the smooth muscle lining the esophagus and two experiencing a perforation of the esophagus

(occurring in both patients with delayed diagnoses). One patient's extensive injury resulted in a tracheoesophageal fistula, an opening between the trachea and esophagus.

"In conclusion, severe injury can occur rapidly following disc battery ingestion. A high index of suspicion for a disc battery is necessary to avoid life-threatening sequelae. Emergency endoscopic retrieval is required in these situations," the authors write. "A multidisciplinary approach involving otolaryngology and pediatric surgery can be very helpful, especially when a tracheoesophageal fistula and/or uncontained perforation is identified."

(Arch Otolaryngol Head Neck Surg. 2010;136[9]:866-871. Available pre-embargo to the media at www.jamamedia.org.)

Compound boosts marijuana-like chemical in the body to relieve pain at injury site Drug created by UCI, Italian team inhibits enzyme that breaks down anandamide

Irvine, Calif., — American and Italian researchers have found that a novel drug allows anandamide – a marijuana-like chemical in the body – to effectively control pain at the site of an injury.

Led by Daniele Piomelli, the Louise Turner Arnold Chair in Neurosciences and director of the Center for Drug Discovery at UC Irvine, the study suggests that such compounds could form the basis of pain medications that don't produce sedation, addiction or other central nervous system side effects common with existing painkillers, such as opiates.

"These findings raise hope that the analgesic properties of marijuana can be harnessed to curb pain," Piomelli said. "Marijuana itself is sometimes used in clinical settings for pain relief but causes many unwanted effects. However, specific drugs that amplify the actions of natural, marijuana-like chemicals are showing great promise."

For the study, which appears in the Sept. 19 online version of Nature Neuroscience, rats and mice were given a drug created by Piomelli and colleagues at the Italian universities of Urbino and Parma. The researchers discovered that the compound, URB937, did not enter the central nervous system but simply boosted the levels of anandamide in peripheral tissues. Still, it produced a profound analgesic effect for both acute and chronic pain. This was surprising, since anandamide had been thought to only work in the brain.

The synthetic drug inhibits FAAH, an enzyme in the body that breaks down anandamide, dubbed "the bliss molecule" for its similarities to the active ingredient in marijuana. A neurotransmitter that's part of the endocannabinoid system, anandamide has been shown in studies by Piomelli and others to play analgesic, antianxiety and antidepressant roles. It's also important in regulating food consumption. Blocking FAAH activity enhances the effects of anandamide without generating the "high" seen with marijuana.

Piomelli and his team are now collaborating with drug discovery specialists at the Italian Institute of Technology, in Genoa, to develop the new compound – which is protected by a patent application – into a clinically useful medication.

Researchers from UCI, the University of Georgia, the University of Naples, the University of Parma, the University of Urbino and the Italian Institute of Technology participated in the study, which was supported by the National Institute on Drug Abuse and the Italian Ministry of Public Education.

Arctic bugs may have the longest life-cycle on Earth

* 15:34 21 September 2010 by Lewis Dartnell

WITH a hibernation period of up to 100 million years, bacteria discovered on the Arctic sea floor may have longest life cycle of any known organism. Casey Hubert from the Geosciences Group at Newcastle University, UK, and colleagues came across the bacteria while studying biological activity in sediment samples from the sea floor off the Norwegian island of Svalbard. What the team expected to find were organisms that flourish in the cold, but are killed at higher temperatures.

Sure enough there was a peak of microbial activity in the sediment at a warm 20 °C, but then the graph began to pick up again beyond 40 °C, and there was a second peak of biological activity at around 55 °C. A completely unexpected class of heat-loving microbes – thermophiles – had been embedded in the sediment as spores and only germinated as the temperature approached 50 °C.

A look at the genetic sequences of the heat-lovers revealed that they are most closely related to bacteria from ecosystems in the warm, oxygen-depleted depths of oceanic crust or subsurface petroleum reservoirs. So what were heat-loving organisms doing in the freezing sediment of the Arctic?

Hubert's theory, presented earlier this month at a Society for General Microbiology meeting in Nottingham, UK, proposes that rising currents thrust some cells out of their deep hot niche and into the cold Arctic seawater, where they lie dormant.

Sediment buries them until the temperature rises enough for them to germinate – but this could take up to a 100 million years. "It's like there's a seed bank in the sediment of diverse thermophiles," says Hubert. These spores can remain viable for millions of years, he says, and so might wait-out the burial period and long

migration down into the warmer subsurface. "This could explain how thermophiles colonise these subsurface niches and populate the deep biosphere," he says.

Geomicrobiologist John Parkes of Cardiff University, UK, points out that there is an alternative explanation. "The entire ocean is circulated through deep oceanic crust about every million years," he says, "so buried sediments could be inoculated as this fluid flows through them on its return to the ocean."

Genocide Wiped Out Native American Population

Physical traces of ethnic cleansing that took place in the early 800s suggest the massacre was an inside job.

By Jennifer Viegas | Mon Sep 20, 2010 07:00 AM ET

Crushed leg bones, battered skulls and other mutilated human remains are likely all that's left of a Native American population destroyed by genocide that took place circa 800 A.D., suggests a new study.

The paper, accepted for publication in the *Journal of Anthropological Archaeology*, describes the single largest deposit to date of mutilated and processed human remains in the American Southwest.

The entire assemblage comprises 14,882 human skeletal fragments, as well as the mutilated remains of dogs and other animals killed at the massacre site -- Sacred Ridge, southwest of Durango, Colo.

Based on the archaeological findings, which include two-headed axes that tested positive for human blood, co-authors Jason Chuipka and James Potter believe the genocide occurred as a result of conflict between different Anasazi Ancestral Puebloan ethnic groups.

"It was entirely an inside job," Chuipka, an archaeologist with Woods Canyon Archaeological Consultants, told *Discovery News*. "The type of event at Sacred Ridge is on the far end of the conflict spectrum where social relations completely melt down," he added, mentioning that the Sacred Ridge "occupants were targeted to take the blame."

Chuijka and Potter analyzed objects excavated at Sacred Ridge, which was a multiple habitation site of 22 pit structures, some of which may have operated as communal ritual facilities for a population that extended beyond the immediate site inhabitants. This suggests the residents at one point exerted some social control in the area.

The unearthed bones and artifacts indicate that when the violence took place, men, women and children were tortured, disemboweled, killed and often hacked to bits. In some cases, heads, hands and feet appear to have been removed as trophies for the killers. The attackers then removed belongings out of the structures and set the roofs on fire.

"I think that the major event was preceded by social stress within the community that may have been exacerbated by a period of drought," Chuipka said. "The scale of the mutilations suggests that it was planned and organized in the preceding days or weeks, and that the violence took place in a relatively short period of time -- a few days." "All evidence points to a rapid event, which is only possible with coordination and complicity within the community," he added.

The researchers ruled out other possible explanations, such as starvation cannibalism, traditional preparation of the deceased, and even individuals targeted for practicing witchcraft. Cannibalism, for example, usually involves bone marrow processing. Witch roundups tend to affect a relatively small number of victims.

In this case, a large group of people was dispatched at one time.

For a separate study, John McClelland, lab manager of osteology at Arizona State Museum, analyzed teeth from human remains within the Ridges Basin region, including Sacred Ridge.

He found that the population at Sacred Ridge in the early 800s was distinct from others in the area.

"The individuals at Sacred Ridge whose remains were disarticulated and processed were not a random selection from among the overall population of Ridges Basin," McClelland determined. "In addition to the biological differences, they appear to have had a somewhat different diet and may have experienced a higher level of juvenile growth disruption."

At least two other separate studies have come to similar conclusions, suggesting the genocide victims at Sacred Ridge belonged to an ethnic group that was different from that of other nearby populations.

Given basic established patterns from more recent ethnic cleansing in Yugoslavia, Iraq and Rwanda, the researchers think political structures that had been keeping ethnic conflict at bay probably broke down at Sacred Ridge.

"What we can learn from Sacred Ridge is that archaeological sites are not simply piles of rock and refuse, but that they were occupied by people that were involved in complex webs of social relations," Chuipka said. "Sacred Ridge is a case where social relations melted down and the solution chosen was absolute and shocking."

The Martian Moon Phobos May Have Formed By Catastrophic Blast

Scientists now have firm indications that the Martian satellite Phobos formed relatively near its current location via re-accretion of material blasted into Mars' orbit by some catastrophic event. Two independent approaches of compositional analyses of thermal infrared spectra, from ESA's Mars Express and NASA's Mars Global Surveyor missions, yield very similar conclusions. The re-accretion scenario is further strengthened by the measurements of Phobos' high porosity from the Mars Radio Science Experiment (MaRS) on board Mars Express. These results will be presented by Dr. Giuranna and Dr. Rosenblatt at the European Planetary Science Congress in Rome, on Monday 20th September.

The origin of the Martian satellites Phobos and Deimos is a long standing puzzle. It has been proposed that both moons may be asteroids formed in the outer part of the main asteroid belt (between Mars and Jupiter) and were subsequently captured by Mars' gravity. Alternative scenarios suggested that both moons were formed in situ by the re-accretion of rocky-debris blasted into Mars's orbit after a large impact or by re-accretion of remnants of a former moon which was destroyed by Mars's tidal force. "Understanding the composition of the Martian moons is the key to constrain these formation theories", says Dr. Giuranna of the Istituto Nazionale di Astrofisica in Rome, Italy.

Previous observations of Phobos at visible and near-infrared wavelengths have been interpreted to suggest the possible presence of carbonaceous chondritic meteorites, carbon-rich "ultra primitive" materials, commonly associated with asteroids dominant in the middle part of the asteroid belt. This finding would support the early asteroid capture scenario. However recent thermal infrared observations from the Mars Express Planetary Fourier Spectrometer, show poor agreement with any class of chondritic meteorite. They instead argue in favor of the in-situ scenarios.

"We detected for the first time a type of mineral called phyllosilicates on the surface of Phobos, particularly in the areas northeast of Stickney, its largest impact crater", says Dr. Giuranna.

"This is very intriguing as it implies the interaction of silicate materials with liquid water on the parent body prior to incorporation into Phobos. Alternatively phyllosilicates may have formed in situ, but this would mean that Phobos required sufficient internal heating to enable liquid water to remain stable. More detailed mapping, in-situ measurements from a lander, or sample return would ideally help to settle this issue unambiguously," he added.

Other observations appear to match the types of minerals identified on the surface of Mars. Thus, the derived composition on Phobos appears more closely related to Mars than objects from other relatively locations in the solar system.

"The asteroid capture scenarios also have difficulties in explaining the current near-circular and near-equatorial orbit of both Martian moons", says Dr Rosenblatt of the Royal Observatory of Belgium.

The MaRS team, led by Dr. Martin Pätzold of the Rheinisches Institut für Umweltforschung an der Universität zu Köln, Germany, has used the frequency variations of the radio-link between the spacecraft and the Earth-based tracking stations, in order to precisely reconstruct the motion of the spacecraft when it is perturbed by the gravitational attraction of Phobos. From this the team was able to reduce Phobos's mass. "We obtained the best measurement of its mass to date, with a precision of 0.3%", relates Dr. Rosenblatt. Phobos's volume past estimations were also improved thanks to the cameras onboard MEx. The MaRS team was thus able to derive the best-ever estimate of Phobos' density as 1.86 ± 0.02 g/cm³. "This number is significantly lower than the density of meteoritic material associated with asteroids. It implies a sponge-like structure with voids making up 25-45% in Phobos' interior", says Dr. Rosenblatt. "High porosity is required in order to absorb the energy of the large impact that generated Stickney crater without destroying the body", confirms Dr. Giuranna. "In addition a highly porous interior of Phobos, as proposed by the MaRS team, supports the re-accretion formation scenarios".

A highly porous asteroid would have probably not survived if captured by Mars. Alternatively, such a highly porous Phobos can result from the re-accretion of rocky-blocks in Mars' orbit. During re-accretion, the largest blocks re-accrete first because of their larger mass, forming a core with large boulders. Then, the smaller debris re-accrete but do not fill the gaps left between the large blocks because of the low self-gravity of the small body in formation. Finally, a relatively smooth surface masks the space of voids inside the body, which then can only be indirectly detected. Thus, a highly porous interior of Phobos, as proposed by the MaRS team, supports the re-accretion formation scenarios.

The origin of both Martian moons is not, however, definitively elucidated since the density alone cannot provide the true composition of their interior. The future Russian Phobos-Grunt mission (Phobos Sample Return), to be launched in 2011, will certainly contribute to our understanding regarding the origin of Phobos.

Cambridge firm hopeful, cautious on gene therapy

By Carolyn Y. Johnson, Globe Staff | September 16, 2010

A Cambridge biotechnology company has developed a gene therapy that successfully treated a 21-year-old French man who suffers from an inherited blood disorder called beta thalassemia, allowing him to forgo monthly transfusions that he has depended on since childhood.

The case, reported yesterday in the journal *Nature*, is the latest example of progress in the field of gene therapy. Bluebird Bio, the company developing the therapy, plans to recruit nine additional patients for its clinical trial, which will include patients with beta thalassemia and sickle cell anemia.

"Now, the patient has been without any transfusions for two years. . . . I must say we want to be cautious — nevertheless, at this point it's good to see the patient lives a normal life for the first time, has a full-time job in a restaurant in Paris as a cook," said Dr. Philippe Leboulch, a visiting professor at Harvard Medical School and a professor of medicine at the University of Paris, who is the senior author of the study.

Leboulch, who is a member of Bluebird's scientific advisory board, said he began the work that led to the new therapy 20 years ago. In June 2007, researchers removed the patient's bone marrow and used a virus to insert corrected copies of the defective gene in marrow cells. They gave the patient chemotherapy to eliminate his blood cell precursors that carried the genetic defect, before returning the modified cells to the patient.

Leboulch said that the results were promising, but emphasized that scientists were proceeding with caution and carefully monitoring the patient for side effects.

He noted that they are monitoring cells in the patient that overproduce a protein that has been found to contribute to tumors, but the patient is healthy.

Outside researchers said that this was an exciting success.

"This is a very significant study. Beta thalassemia is really challenging for gene therapy," said Guangping Gao, the director of the gene therapy center at the University of Massachusetts Medical School, who was not involved in the study. "One patient is a very small study, but this is really a milestone."

Bluebird Bio was until very recently known as Genetix Pharmaceuticals, and for the company the trial is part of a larger thrust into gene therapy. The company recently received \$35 million in venture capital funding.

Beta thalassemia is a genetic disease that causes anemia, and patients need monthly blood transfusions over their lifetime. Those transfusions cause iron to build up in the body, potentially damaging organs and requiring further treatment. The disease is more common outside the United States, and 60,000 children worldwide are diagnosed with it each year.

"This is a huge public health problem outside the US," said Nick Leschly, the chief executive of Bluebird.

The company also has a program in gene therapy treatments for adrenoleukodystrophy, a brain-wasting disease. Researchers published a paper in the journal *Science* last year showing positive results in two patients with that illness.

In an accompanying opinion piece published in *Nature*, Derek A. Parsons of the St. Jude Children's Research Hospital in Memphis noted that a decade ago, gene therapy research paused. Viruses that were used to deliver the genes caused leukemia in some patients.

Most prominently, Jesse Gelsinger, an 18-year-old with a genetic liver disease, died after being treated with gene therapy in 1999, when viruses triggered a massive immune response.

But recently, gene therapy has had a string of successes, including against a rare disease that causes blindness, called Leber's congenital amaurosis. Researchers have also reported good results with "bubble boy disease," a lack of natural immunity that leaves children vulnerable to infections.

"I think the work started too fast in the field, because the name coined - gene therapy - was appealing to many. People wanted to have cures tomorrow," Leboulch said. "But it took a little bit of time to try the waters."

Can Caffeine Really Cause Insanity?

By Remy Melina, Life's Little Mysteries Staff Writer

A Kentucky man is invoking temporary insanity brought on by caffeine intoxication as his legal strategy to claim that he did not, as accused, murder his wife. Prosecutors allege Woody Will Smith strangled his wife to death with an extension cord on May 4, 2009, according to the *Kentucky Enquirer*. Smith's lawyer claims that Smith, 33, became mentally unstable after weeks of downing sodas, energy drinks and caffeine-laced diet pills.

At the start of Smith's murder trial on today (Sept. 20), Smith's lawyer told the Newport, Ky., court that the high level of caffeine caused his client to become so mentally unstable that he couldn't have knowingly killed his wife. This defense has been successfully used in court before, but does it make sense medically?

Caffeine-induced psychosis is not recognized by the Diagnostic and Statistical Manual of Mental Disorders (DSM), the reference book psychologists use when making diagnoses. However, the book does recognize caffeine intoxication, in which a person encounters ill-effects after ingesting 250 milligrams of caffeine (about two to three cups of brewed coffee) or more.

Hallucination more likely

The symptoms of caffeine intoxication listed in the DSM include rambling flows of thought and speech, cardiac arrhythmia, muscle twitching, gastrointestinal disturbance, insomnia, agitation (such as pacing around a room or wringing one's hands) and nervousness.

A 2009 study conducted by researchers at Durham University in England determined that people who ingest the caffeine equivalent of three cups of brewed coffee (or seven cups of instant coffee) are more likely to hallucinate. Heavy coffee drinkers had a three-times-higher tendency to hear voices and see things that were not there than those who consumed the equivalent of a half-cup of brewed coffee (or one cup of instant coffee).

Some negative, nervous reactions to caffeine, such as biting one's fingernails, may have an inherited explanation. People with certain genetic variations are more likely to bite their nails after drinking caffeine than those who don't, according to a 2002 study by University of Chicago researchers.

University of Chicago researchers also conducted a test in 2008 to see how much caffeine is needed to caffeine-induced anxiety, and found that while the highest dose used in their study (450 mg) increased anxiety in the majority of subjects.

Making matters worse

Behavioral or mental illnesses may make caffeine's effects even worse for some. "Those with an underlying anxiety disorder may be more sensitive to the effects of caffeine," said Emma Childs of the University of Chicago, lead author of the 2008 study.

Childs told Life's Little Mysteries that while doses as high as 450 mg of caffeine caused some subjects to feel negative effects, including nausea, nervousness or jitteriness, the researchers saw no increases anger or hostility in the subjects during the study.

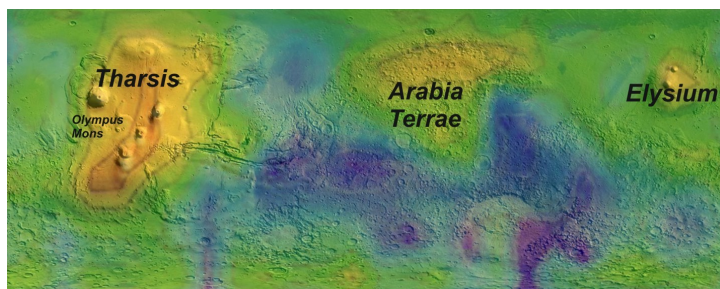
But the too-much-java defense has been used before, with some success.

Daniel Noble, then 31, blamed caffeine-induced psychosis for his hit-and-run accident at Washington State University, during which he broke the legs of two students. Police subdued the 300-pound man with a stun gun after he resisted arrest and ran from the officers – while wearing only pajamas in 5-degree Fahrenheit (–15-degree Celsius) weather, according to ABC News. A Whitman County, Wash., judge threw out the charges against Noble when it was found that he was suffering from undiagnosed bipolar disorder. However, the judge banned Noble from consuming any caffeinated products, according to news reports.

Mars Methane Gets Even More Mysterious

Posted in: Mars **by Nancy Atkinson**

Mars' atmosphere consists of 95% carbon dioxide, 3% nitrogen, 1.6% argon, and contains small amounts of oxygen and water, as well as trace amounts of methane. The methane – although small in percentage – might be the most intriguing because the source of this very short-lived gas remains a mystery. And the mystery has just gotten a little more puzzling, as the lifetime of methane in Mars atmosphere appears to be even shorter than scientists has originally thought. Using observations from the Mars Global Surveyor — which functioned in orbit around for almost ten years – a group of scientists from Italy have determined the methane in the atmosphere of Mars lasts less than a year.



Map of methane concentrations in Autumn (first martian year observed) overlaid on true colour map of Mars.

Credit: NASA/Università del Salento

Scientists Sergio Fonti (Università del Salento) and Giuseppe Marzo (NASA Ames) reported their findings of evolution of the methane over three Martian years at the European Planetary Science Congress in Rome.

“Only small amounts of methane are present in the Martian atmosphere, coming from very localized sources,” said Fonti. “We’ve looked at changes in concentrations of the gas and found that there are seasonal and also annual variations. The source of the methane could be geological activity or it could be biological – we can’t tell at this point. However, it appears that the upper limit for methane lifetime is less than a year in the Martian atmosphere.”

Levels of methane are highest in autumn in the northern hemisphere, with localized peaks of 70 parts per billion, although methane can be detected across most of the planet at this time of year. There is a sharp

decrease in winter, with only a faint band between 40-50 degrees north. Concentrations start to build again in spring and rise more rapidly in summer, spreading across the planet.

“One of the interesting things that we’ve found is that in summer, although the general distribution pattern is much the same as in autumn, there are actually higher levels of methane in the southern hemisphere. This could be because of the natural circulation occurring in the atmosphere, but has to be confirmed by appropriate computer simulations,” said Fonti.

There are three regions in the northern hemisphere where methane concentrations are systematically higher: Tharsis and Elysium, the two main volcano provinces, and Arabia Terrae, which has high levels of underground water ice. Levels are highest over Tharsis, where geological processes, including magmatism, hydrothermal and geothermal activity could be ongoing.

“It’s evident that the highest concentrations are associated with the warmest seasons and locations where there are favorable geological – and hence biological – conditions such as geothermal activity and strong hydration. The higher energy available in summer could trigger the release of gases from geological processes or outbreaks of biological activity,” said Fonti.

The mechanisms for removing methane from the atmosphere are also not clear. Photochemical processes would not break down the gas quickly enough to match observations. However, wind driven processes can add strong oxidisers to the atmosphere, such as the highly reactive salt perchlorate, which could soak up methane much more rapidly.

Martian years are nearly twice as long as Earth years. The team used observations from the Thermal Emission Spectrometer (TES) on Mars Global Surveyor between July 1999 and October 2004. The team studied one of the characteristic spectral features of methane in nearly 3 million TES observations, averaging data together to eliminate noise.

“Our study is the first time that data from an orbiting spectrometer has been used to monitor methane over an extended period,” Fonti said. “The huge TES dataset has allowed us to follow the methane cycle in the Martian atmosphere with unprecedented accuracy and completeness. Our observations will be very useful in constraining the origins and significance of Martian methane.”

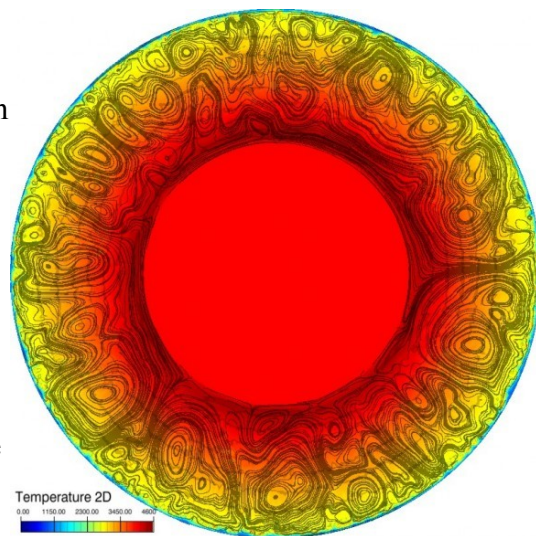
Methane was first detected in the Martian atmosphere by ground based telescopes in 2003 and confirmed a year later by ESA’s Mars Express spacecraft. Last year, observations using ground based telescopes showed the first evidence of a seasonal cycle.

Hot Atmosphere of Venus Might Cool the Interior

Posted in: Venus **by Nancy Atkinson**

Venus is so hot, it’s cool! This very groovy 1960’s-looking image shows the temperature distribution within Venus and local mobilization at the surface, and is the result of new model of the atmosphere of Earth’s sister planet. The model reveals that the heat in the atmosphere induced from a strong greenhouse warming might actually have had a cooling effect on Venus’ interior. While counter intuitive, the theory might explain why Venus was a highly volcanic planet in the past. And interestingly, it might mean that Venus may have some active volcanoes even today. If so, that would be like, outta sight, man!

“For some decades we’ve known that the large amount of greenhouse gases in the atmosphere of Venus cause the extreme heat we observe presently,” said Lena Noack from the German Aerospace Center (DLR) in Berlin, lead author of the study who presented her findings at the European Planetary Science Congress (EPSC) in Rome.



Temperature distribution within Venus and local mobilization at the surface. Credit: DLR

“The carbon dioxide and other greenhouse gases that are responsible for the high temperatures were blown into the atmosphere by thousands of volcanoes in the past,” Noack said. “The permanent heat – today we measure almost 470 degrees Celsius globally on Venus – might even have been much higher in the past and, in a runaway cycle, led to even more volcanism. But at a certain point this process turned on its head – the high temperatures caused a partial mobilization of the Venusian crust, leading to an efficient cooling of the mantle, and the volcanism strongly decreased. This resulted in lower surface temperatures, rather comparable to today’s temperature on Venus, and the mobilization of the surface stopped.”

The source of the magma, or molten rocky material, and the volcanic gases lies deep in the mantle of Venus. The decay of radioactive elements, inherited from the building blocks of the Solar System's planets, and the heat stored in the interior from planet formation produce enough heat to generate partial melts of silicate-, iron- and magnesium-rich magma in the upper mantle. Molten rock has more volume and is lighter than the surrounding solid rock of identical composition. The magma therefore can rise upwards and eventually penetrate through the rigid crust in volcanic vents, spreading lava over the surface and blowing gases into the atmosphere, mostly greenhouse gases like carbon dioxide (CO₂), water vapor (H₂O) and sulfur dioxide (SO₂).

However, the more greenhouse gases, the hotter the atmosphere – possibly leading to even more volcanism. To find out if this runaway process would end in a red-hot Venus, Lena Noack and Doris Breuer, co-author of the study, calculated for the first time a model where the hot atmosphere is 'coupled' to a 3D model of the planet's interior. Unlike here on Earth, the high temperatures have a much bigger effect at the interface with the rocky surface, heating it up to a large extent.

"Interestingly, due to the rising surface temperatures, the surface is mobilized and the insulating effect of the crust diminishes," said Noack. "The mantle of Venus loses much of its thermal energy to the outside. It's a little bit like lifting the lid on the mantle: the interior of Venus suddenly cools very efficiently and the rate of volcanism ceases. Our model shows that after that 'hot' era of volcanism, the slow-down of volcanism leads to a strong decrease of the temperatures in the atmosphere".

The calculations of the geophysicists yield another interesting result: the process of volcanic resurfacing takes place at different places at different times. When the atmosphere cools, the mobilization of the surface stops. However, there are indications from the European Space Agency's Venus Express mission that there may be a few active volcanoes even today which resurface some spots with lava flows. While no volcanic activity has actually been seen, Venus Express has detected 'hot spots', or unusual high surface temperatures at volcanoes previously thought to be extinct. So far no 'smoking gun', or active volcano has been identified on Venus – but it perhaps Venus Express or future space probes will detect the first active volcano on Earth's neighbor.

Is there a Moore's law for science?

* 01:36 21 September 2010 by Rachel Courtland

The first Earth-like exoplanet discovery could be made in less than a year

Can the rate of past discoveries be used to predict future ones? We may soon find out. Two researchers have used the pace of past exoplanet finds to predict that the first habitable Earth-like planet could turn up in May 2011.

In 1965, Intel co-founder Gordon Moore observed that the number of transistors that fit on a chip doubles about once every two years – a trend now known as Moore's law. Samuel Arbesman of Harvard Medical School in Boston wants to see if scientometrics – the statistical study of science itself – can similarly be used to not only study past progress but also to make predictions.

He and Greg Laughlin of the University of California, Santa Cruz, are testing the idea with exoplanets. Over the past 15 years or so, the pace of planet discoveries has been accelerating, with some 490 planets now known. "It is actually somewhat similar to Moore's law of exponential growth," Arbesman says.

Habitability metric

To predict when astronomers might find the first planet similar in size to Earth that also orbits far enough from its star to boast liquid water, the team scoured the discovery records of 370 exoplanets.

They focused on two basic properties needed for habitability: a planet's mass and its surface temperature. They used these two factors to assign each planet a 'habitability metric' ranging from 0 to 1, where 0 was uninhabitable and 1 is close to Earth's twin.

A rough estimate of each planet's habitability was then plotted against the date of its discovery. Using different subsets of the 370 planets, the researchers made curves from the individual points and extrapolated the curves to find when a planet would be found with a habitability of 1. They then analysed the range of discovery dates to determine which would be most probable.

Their calculations suggest there is a 50 per cent chance that the first habitable exo-Earth will be found by May 2011, a 75 per cent chance it will be found by 2020, and a 95 per cent chance it will be found by 2264.

Change of pace

In fact, exoplanet researchers have made forecasts of the future informally, plotting the mass of planets against the date of discovery to see how the field is progressing. "We've done that for many years at conferences," says Eric Ford of the University of Florida in Gainesville. "The new aspect of this paper is putting an uncertainty on those predictions and unfortunately the uncertainty is quite large."

One source of uncertainty is how factors like changes in funding and the development of new techniques and technology can alter the pace of discovery. "Like the stock market, past returns are no guarantee of future performance," Ford says.

"There are always these complex factors of how science is actually done," Arbesman agrees. But he says the forecasting technique could still prove useful, even if these factors are not accounted for directly. In part, that is because new technologies tend to take a while to ramp up, so they may not lead to sharp jumps in the number of discoveries made.

Previously, Arbesman has quantified how the ease of discovering new mammalian species, chemical elements, and asteroids affects the rate of their discovery. New species and asteroids are more difficult to find the smaller they are, and indeed larger ones are found first. For chemical elements, the opposite is true, since the bigger they are, the rarer and more unstable they tend to be. *Journal reference: PLoS ONE (in press)*

Regimens: Massage Benefits Are More Than Skin Deep

By RONI CARYN RABIN

Does a good massage do more than just relax your muscles? To find out, researchers at Cedars-Sinai Medical Center in Los Angeles recruited 53 healthy adults and randomly assigned 29 of them to a 45-minute session of deep-tissue Swedish massage and the other 24 to a session of light massage.

All of the subjects were fitted with intravenous catheters so blood samples could be taken immediately before the massage and up to an hour afterward.

To their surprise, the researchers, sponsored by the National Center for Complementary and Alternative Medicine, a division of the National Institutes of Health, found that a single session of massage caused biological changes.

Volunteers who received Swedish massage experienced significant decreases in levels of the stress hormone cortisol in blood and saliva, and in arginine vasopressin, a hormone that can lead to increases in cortisol. They also had increases in the number of lymphocytes, white blood cells that are part of the immune system.

Volunteers who had the light massage experienced greater increases in oxytocin, a hormone associated with contentment, than the Swedish massage group, and bigger decreases in adrenal corticotropin hormone, which stimulates the adrenal glands to release cortisol.

The study was published online in *The Journal of Alternative and Complementary Medicine*.

The lead author, Dr. Mark Hyman Rapaport, chairman of psychiatry and behavioral neurosciences at Cedars-Sinai, said the findings were "very, very intriguing and very, very exciting — and I'm a skeptic."

Why Thinking of Nothing Can Be So Tiring: Brain Wolfs Energy to Stop Thinking

Ever wonder why it's such an effort to forget about work while on vacation or to silence that annoying song that's playing over and over in your head? Mathematicians at Case Western Reserve University may have part of the answer. They've found that just as thinking burns energy, stopping a thought burns energy -- like stopping a truck on a downhill slope.

"Maybe this explains why it is so tiring to relax and think about nothing," said Daniela Calvetti, professor of mathematics, and one of the authors of a new brain study. Their work is published in an advanced online publication of *Journal of Cerebral Blood Flow & Metabolism*.

Opening up the brain for detailed monitoring isn't practical. So, to understand energy usage, Calvetti teamed with Erkki Somersalo, professor of mathematics, and Rossana Occhipinti, who used this work to help earn a PhD in math last year and is now a postdoctoral researcher in the department of physiology and biophysics at the Case Western Reserve School of Medicine. They developed equations and statistics and built a computer model of brain metabolism.

The computer simulations for this study were obtained by using *Metabolica*, a software package that Calvetti and Somersalo have designed to study complex metabolic systems. The software produces a numeric rendering of the pathways linking excitatory neurons that transmit thought or inhibitory neurons that put on the brakes with star-like brain cells called astrocytes. Astrocytes cater essential chemicals and functions to both kinds of neurons.

To stop a thought, the brain uses inhibitory neurons to prevent excitatory neurons from passing information from one to another. "The inhibitory neurons are like a priest saying, 'Don't do it,'" Calvetti said. The "priest neurons" block information by releasing gamma aminobutyric acid, commonly called GABA, which counteracts the effect of the neurotransmitter glutamate by excitatory neurons. Glutamate opens the synaptic gates. GABA holds the gates closed.

"The astrocytes, which are the Cinderellas of the brain, consume large amounts of oxygen mopping up and recycling the GABA and the glutamate, which is a neurotoxin," Somersalo said.

More oxygen requires more blood flow, although the connection between cerebral metabolism and hemodynamics is not fully understood yet. All together, "It's a surprising expense to keep inhibition on," he said.

The group plans to more closely compare energy use of excitatory and inhibitory neurons by running simultaneous simulations of both processes.

The researchers are plumbing basic science but their goal is to help solve human problems.

Brain disease or damaging conditions are often difficult to diagnose until advanced stages. Most brain maladies, however, are linked to energy metabolism and understanding what is the norm may enable doctors to detect problems earlier. The toll inhibition takes may, in particular, be relevant to neurodegenerative diseases. "And that is truly exciting" Calvetti said.

Story Source: The above story is reprinted (with editorial adaptations by ScienceDaily staff) from materials provided by Case Western Reserve University, via EurekAlert!, a service of AAAS.

Journal Reference: 1. Rossana Occhipinti, Erkki Somersalo, Daniela Calvetti. Energetics of inhibition: insights with a computational model of the human GABAergic neuron-astrocyte cellular complex. Journal of Cerebral Blood Flow & Metabolism, 2010; DOI: 10.1038/jcbfm.2010.107

Surgeon was 'arrogant caricature' GMC hears

A leading surgeon stabbed a colleague's forehead with a needle and left a clip inside a patient during surgery, a General Medical Council panel heard.

James Johnson, a former chairman of the British Medical Association (BMA), behaved like a "caricature of surgical arrogance", the panel was told. Mr Johnson, 64, a consultant at hospitals in Runcorn and Warrington, is accused of misconduct. He denies the charges and has said he will "vigorously defend" his position.

'Seasoned surgeon'

Andrew Colman, counsel for the General Medical Council (GMC), said that Mr Johnson's behaviour "reflected rather a caricature of surgical arrogance that was out of place even decades ago, other than through the lampooning lens of cinema comedies."

The hearing heard that Mr Johnson, a "seasoned surgeon and distinguished doctor" railed against the "incompetence" of theatre staff and was acting so "furiously" during one operation that he accidentally stabbed a house officer with the needle. During the same operation on a 69-year-old woman in July 2007, staff tried to tell him that a bulldog clip was still in the patient's leg, but he was "in no mood to listen", the panel heard, and Mr Johnson proceeded to sew the wound up.

He later amputated another patient's leg and is accused of failing to consider amputating a toe as an alternative.

'Conflicting pressures'

The charges he faces at the hearing in Manchester relate to 14 patients who were operated on between 2006 and 2008. Mr Johnson is also accused of failing to ensure patients were warned about the possible risks of certain procedures and that some of the operations performed were "not surgically appropriate".

The surgeon for the North Cheshire Hospitals NHS Trust was the public face of the BMA for almost half of the 19-month period in which his conduct is being investigated.

The panel heard that Mr Johnson's role as BMA chairman, which he held between July 2003 and May 2007, led to "conflicting pressures of time". The hearing is scheduled to last into November.

Winds could explain Biblical parting of the Red Sea

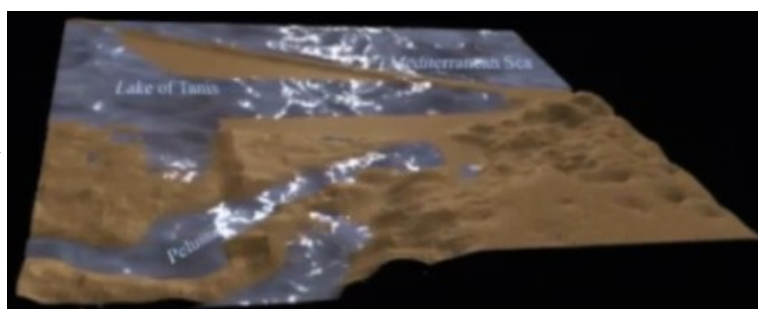
Computer simulations show how the movement of wind could have parted the waters of the Red Sea

The parting of the Red Sea, as described in the Bible, could have been a phenomenon caused by strong winds, according to new computer simulations.

The account in the Book of Exodus describes how the waters of the sea parted, allowing the Israelites to flee their Egyptian pursuers.

Simulations by US scientists show how the movement of wind could have opened up a land bridge at one location. This would have enabled people to walk across exposed mud flats to safety. The results are published in the open-access journal Plos One.

The researchers show that a strong east wind, blowing overnight, could have pushed water back at a bend where an ancient river is believed to have merged with a coastal lagoon. 63mph winds from the east could have pushed the water back at an ancient river bend



With the water pushed back into both waterways, a land bridge would have opened at the bend, enabling people to walk across exposed mud flats to safety. As soon as the wind died down, the waters would have rushed back in.

The study is based on a reconstruction of the likely locations and depths of Nile delta waterways, which have shifted considerably over time. "The simulations match fairly closely with the account in Exodus," said the study's lead author Carl Drews, from the US National Center for Atmospheric Research (NCAR).

"The parting of the waters can be understood through fluid dynamics. The wind moves the water in a way that's in accordance with physical laws, creating a safe passage with water on two sides and then abruptly allowing the water to rush back in."

The study is part of a larger research project by Mr Drews into the impacts of winds on water depths, including the extent to which Pacific Ocean typhoons can drive storm surges.

By pin-pointing a possible site south of the Mediterranean Sea for the crossing, the study also could be of benefit to archaeologists seeking to research the account.

A way through

In the Book of Exodus, Moses and the fleeing Israelites became trapped between the Pharaoh's advancing chariots and a body of water that has been variously translated as the Red Sea or the Sea of Reeds.

The Biblical account says that, as the Pharaoh's army followed, the waters rushed in

In a divine miracle, the account says, a mighty east wind blew all night, splitting the waters and leaving a passage of dry land with walls of water on both sides.

The Israelites were able to flee to the other shore. But when the Egyptian Pharaoh's army attempted to pursue them in the morning, the waters rushed back and drowned the soldiers.

Other scientists have also sought to explain the account through natural processes.

Some have speculated that a tsunami could have caused waters to retreat and advance rapidly. But the scientists behind the latest research point out that such an event would not have caused the gradual overnight divide of the waters or have been associated with winds.

Other researchers have focused on a phenomenon known as "wind setdown," in which a particularly strong and persistent wind can lower water levels in one area while piling up water downwind.

<http://www.bbc.co.uk/news/science-environment-11383620>



Prehistoric 'baby sling' claimed to have increased brain size

A recent research by a leading British prehistorian maintains that the most important aspect of human evolution was facilitated by a crucial technological device invented by early Stone Age women. Archaeologist and anthropologist Timothy Taylor of Bradford University claims that increased brain size was made possible by the invention of the baby sling, a development which enabled slower growing, physically and mentally immature offspring to survive and flourish.

"In effect, kangaroo-style, early female human ancestors became marsupial, carrying their immature youngsters outside their wombs," said Dr Taylor. "The invention of the baby sling, which allowed more babies to successfully mature outside the female body, instantly removed the barrier to increased head and brain size."

Before the invention of the baby sling, dated by Dr Taylor to at least 2.2 million years ago, when human ancestor head size suddenly began to increase, physically mature infants were more likely to survive, because caring for slower-developing immature ones was difficult, uneconomic and often dangerous. Mothers holding their infants were more vulnerable to attack from predators or other humans than those using baby slings. "The implications of this development were enormous. It meant that babies could continue to develop outside the womb after birth and that their brains could continue to grow. They were not constrained by the size of their mothers' pelvises and could grow bigger and bigger for years. It gave us scope for intellectual expansion. Most importantly, the invention of the baby sling artificially lengthened human gestation," said Dr Taylor.

We did not invent technology, Dr Taylor argues. Technology invented us. "Courtesy of the baby sling, our ancestors got smarter," he concluded. *Edited from The Guardian (5 September 2010), The Independent (6 September 2010)*

Children 'miss cues' that a dog may be dangerous

Young children are being taught to interpret dog body language in a bid to cut the number of attacks.

Surveys suggest nearly half of all children will be bitten by a dog at some point, with the under-7s at greatest risk. Researchers have discovered a common mistake children make is to interpret bared teeth as a doggy smile.

Lincoln University is developing an interactive DVD to teach children as young as three how to read dog cues.

Figures suggest that each year, approximately 4,000 people in the UK attend A&E after being bitten by a dog.



Dog baring its teeth Children may misinterpret growls as smiles

Although severe dog attacks, particularly those involving children, are well publicised, they remain relatively rare. However, even a single bite can cause scarring.

Research which examines how children "scan" a dog's face shows that younger children focus on the mouth and teeth, and that under-fives are far more likely to "lean in" to have a closer look. This increases the risk of being bitten in the face or neck.

Dr Kerstin Meints, from Lincoln University, is helping to assess the bite prevention interactive DVD called "Blue Dog". The DVD shows typical scenes in which a dog may feel threatened and react aggressively, such as a child approaching its food or pushing it off the sofa. The child playing the DVD is given choices, and shown the difference between unsafe and safe behaviour.

Dr Meints said that even very young children could learn to avoid unsafe choices, such as startling a dog by kissing it while asleep. She said: "Even two weeks later when they are re-tested they still know how to choose the safe option." She said that nurseries and primary schools should consider using the DVD. "The child may not have a dog at home, but most youngsters will come into contact with one. While it can't guarantee the child will never get bitten, it will hopefully help reduce the chances."

Fellow researcher Dr Tiny de Keuster added: "We hope the Blue Dog Programme will make a difference immediately by teaching parents and children about living with a dog, from the dog's perspective."

Tracy Genever, an education development manager at the Blue Cross charity, said it was important that children could recognise the "warning signs". She said: "It's really important for children to learn to appreciate things from a dog's point of view, to help them understand better what a dog is feeling and know when it is safe to approach. "Just because a dog looks sad, it doesn't necessarily mean it wants a hug."

Their research will be presented at the World Safety Conference in London.

A scientific research study analyzes when to buy airline and theater tickets

Do you fancy watching a musical in London? Then, according to a research study at the Universidad Carlos III de Madrid (UC3M) if you want to save money you should buy your airline ticket long in advance, but postpone the purchase of your theater ticket until the last minute.

Why do airline tickets become more expensive as the travel date approaches whereas theater tickets are sold at half price in Leicester Square on the day of the performance? In their recent article published in the Economic Journal, ("Advance Purchase Discounts versus Clearance Sales"), Professors Marc Möller and Makoto Watanabe from the UC3M Department of Economics have considered the pricing of products that can be purchased in advance, i.e., long before their actual date of consumption. Further examples include seasonal products like the newest skiing equipment or entry slots for marathons.

According to the study, there are two determining factors for optimal planning for prices. On the one hand, when purchasing early, consumers face uncertainty with respect to their own future demands. "When we reserve our flight to London weeks ahead we have to take into account the possibility that unforeseen circumstances could keep us from traveling to London", the study's authors explained. "In order to make consumers take their chances, airlines have to offer advance purchase discounts. As a consequence ticket prices increase as the travel date approaches," they added.

On the other hand, when purchasing late, consumers face the risk of becoming rationed. When we purchase our theater ticket last minute, there exists the possibility that the event has sold out. In order to make consumers bear this risk, theaters implement a clearance sale by offering last minute discounts. As a consequence ticket prices decrease on the day of the performance

The optimal dynamic pricing strategy depends on the interplay between individual demand uncertainty and rationing risks. In turn, rationing risks depend on a comparison of demand and supply and hence on the seller's capacity. Differences in dynamic pricing can therefore be explained by differences in capacities. Marc Möller

and Makoto Watanabe show that advance purchase discounts will be employed by sellers whose capacity is relatively small in comparison to demand whereas Clearance Sales are optimal when capacities are large. Hence differences in the pricing of airline and theater tickets can be explained by the fact that air travel to London is a relatively tight market while the long running musicals of London's West End are very unlikely to become sold out.

The article shows further that clearance sales are more likely and advance purchase discounts are less likely to be observed in markets where prices can be committed to in advance, temporal capacity limits are difficult to implement, and resale is feasible. These results provide further reason for the observed differences in pricing.

In addition, in his ongoing research Makoto *Watanabe has found evidence which shows that air fares are lowest around eight weeks before the travel date. Moreover, it seems as if tickets are cheaper when purchased in the afternoons, rather than the mornings.* Do airlines price discriminate between business travelers who book their tickets at work and leisure travelers who book from home? This claim still has to be confirmed in future research. http://www.uc3m.es/portal/page/portal/actualidad_cientifica/noticias/buy_cheap_tickets

Stroke Gene Discovered

A Dutch-German medical research team led by Harald Schmidt from Maastricht University, Netherlands, and Christoph Kleinschnitz, University of Würzburg, Germany, has discovered that an enzyme is responsible for the death of nerve cells after a stroke. The enzyme NOX4 produces hydrogen peroxide, a caustic molecule also used in bleaching agents. Inhibition of NOX4 by an experimental new drug in mice with stroke dramatically reduces brain damage and preserves brain functions, even when given hours after the stroke.

These findings will be published next week in the online, open access journal PLoS Biology.

Stroke researcher, Christoph Kleinschnitz, Germany's Young Scientist of the Year 2008, explains "Ischemic stroke is the second leading cause of death worldwide. Today, only one approved therapy exists. The effectiveness of this therapy is rather moderate, and, importantly, it can only be used in about 10% of patients; the other 90% are excluded due to contraindications. Thus, there is a huge medical need for better stroke therapies. One such candidate mechanism is oxidative stress. However, approaches to apply antioxidants have failed in clinical stroke trials. This study proposes an entirely new strategy by inhibiting the relevant source of hydrogen peroxide and preventing its formation." Importantly, elimination of the NOX4 gene in mice did not result in any abnormalities and therefore no obvious side-effects are to be expected from a future NOX4 inhibitor drug. This could be demonstrated with the detailed systemic phenotyping analysis by the team of the German Mouse Clinic at the Helmholtz Zentrum München, Germany.

The identification of NOX4 as an enzyme with a key role in killing nerve cells after a stroke in mice makes NOX4 inhibition currently the most promising new therapeutic approach in this often deadly or disabling disease in humans. Pharmacologist, Prof. Schmidt suspects that the findings "May have implications for other disease states in which hydrogen peroxide or related oxygen radicals are suspected to play a major role but where antioxidant or vitamin therapies have failed. Inhibiting now the source of hydrogen peroxide or oxygen radicals may represent the long-sought solution to treating also heart attacks, heart failure, cancer, and other forms of nerve cell degeneration such as in Parkinson's or Alzheimer's disease."

This work was supported by the NHMRC, Australia, the Deutsche Forschungsgemeinschaft (DFG), Germany (to HHHWS and CK), and by the Bundesministerium für Bildung und Forschung within the framework of the NGFN-Plus and the European Commission (EUMODIC).

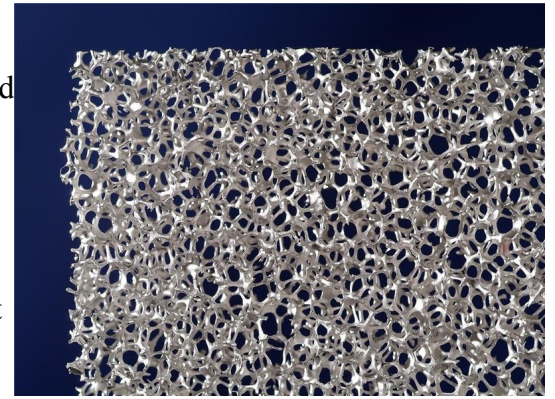
Story Source: *The above story is reprinted (with editorial adaptations by ScienceDaily staff) from materials provided by Public Library of Science, via EurekAlert!, a service of AAAS.*

Journal Reference: *1. Malcolm McLeod, Christoph Kleinschnitz, Henrike Grund, Kirstin Wingler, Melanie E. Armitage, Emma Jones, Manish Mittal, David Barit, Tobias Schwarz, Christian Geis, Peter Kraft, Konstanze Barthel, Michael K. Schuhmann, Alexander M. Herrmann, Sven G. Meuth, Guido Stoll, Sabine Meurer, Anja Schrewe, Lore Becker, Valérie Gailus-Durner, Helmut Fuchs, Thomas Klopstock, Martin Hrabé de Angelis, Karin Jandeleit-Dahm, Ajay M. Shah, Norbert Weissmann, Harald H. H. W. Schmidt. Post-Stroke Inhibition of Induced NADPH Oxidase Type 4 Prevents Oxidative Stress and Neurodegeneration. PLoS Biology, 2010; 8 (9): e1000479 DOI: 10.1371/journal.pbio.1000479*

Titanium foams replace injured bones

Flexible yet rigid like a human bone, and immediately capable of bearing loads: A new kind of implant, made of titanium foam, resembles the inside of a bone in terms of its structural configuration. Not only does this make it less stiff than conventional massive implants. It also promotes ingrowth into surrounding bones.

The greater one's responsibilities, the more a person grows. The same principle applies to the human bone: The greater the forces it bears, the thicker the tissue it develops. Those parts of the human skeleton subject to lesser strains tend to have lesser bone density. The force of stress stimulates the growth of the matrix. Medical professionals will soon be able to utilize this effect more efficiently, so that implants bond to their patients' bones on more sustained and stable basis. To do so, however, the bone replacement must be shaped in a manner that fosters ingrowth – featuring pores and channels into which blood vessels and bone cells can grow unimpeded. Among implants, the titanium alloy Ti6Al4V is the material of choice. It is durable, stable, resilient, and well tolerated by the body. But it is somewhat difficult to manufacture: titanium reacts with oxygen, nitrogen and carbon at high temperatures, for example. This makes it brittle and breakable. The range of production processes is equally limited.



Titanium foams replace injured bones

There are still no established processes that can be used to produce complex internal structures. This is why massive titanium implants are primarily used for defects in load-bearing bones. Admittedly, many of these possess structured surfaces that provide bone cells with firm support. But the resulting bond remains delicate. Moreover, the traits of massive implants are different from those of the human skeleton: they are substantially stiffer, and, thus, carry higher loads. “The adjacent bone bears hardly any load any more, and even deteriorates in the worst case. Then the implant becomes loose and has to be replaced», explains Dr.-Ing. Peter Quadbeck of the Fraunhofer Institute for Manufacturing and Advanced Materials IFAM in Dresden. Quadbeck coordinates the “TiFoam« Project, which yielded a titanium-based substance for a new generation of implants. The foam-like structure of the substance resembles the spongiosa found inside the bone.

The titanium foam is the result of a powder metallurgy-based molding process that has already proven its value in the industrial production of ceramic filters for aluminum casting. Open-cell polyurethane (PU) foams are saturated with a solution consisting of a binding medium and a fine titanium powder. The powder cleaves to the cellular structures of the foams. The PU and binding agents are then vaporized. What remains is a semblance of the foam structures, which is ultimately sintered. “The mechanical properties of titanium foams made this way closely approach those of the human bone”, reports Quadbeck. “This applies foremost to the balance between extreme durability and minimal rigidity.” The former is an important precondition for its use on bones, which have to sustain the forces of both weight and motion. Bone-like rigidity allows for stress forces to be transmitted; with the new formation of bone cells, it also fosters healing of the implant. Consequently, stress can and should be applied to the implant immediately after insertion.

In the “TiFoam« project, the research partners concentrated on demonstrating the viability of titanium foam for replacement of defective vertebral bodies. The foam is equally suitable for “repairing« other severely stressed bones. In addition to the materials scientists from the Fraunhofer institutes IFAM and IKTS – the Institute for Ceramic Technologies and Systems in Dresden – physicians from the medical center at the Technical University of Dresden and from several companies were involved in developing the titanium foam. Project partner InnoTERE already announced that it would soon develop and manufacture “TiFoam«-based bone implants. <http://www.fraunhofer.de/en/press/research-news/2010/09/titanium-foams-replace-injured-bones.jsp>

Ape dung reveals gorilla origin of malaria

HUMANS may have started out malaria-free then caught the disease from gorillas, an analysis of ape faeces suggests.

Malaria is one of our most devastating diseases. Apes carry related malaria-causing parasites, so biologists believed humans were already infected when they split from other great apes, 5 million years ago. Other studies suggest the parasite jumped from chimps to humans at a later date.

Now Beatrice Hahn of the University of Alabama in Birmingham says both theories are wrong, and that human malaria came from gorillas. Hahn analysed 3000 samples of ape faeces from across central Africa. She found six species of malaria parasite, all of them 10 times as genetically diverse as that which infects us. She then created an evolutionary tree for the parasite, revealing that the human parasite is a recent descendant of a gorilla parasite (Nature, vol 467, p 420).

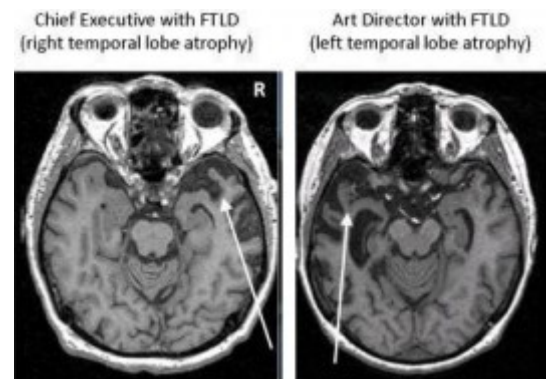
Hahn concludes that apes likely had malaria before humans split from them, but that we didn't take the parasite with us. This may be because we lost the red blood cell molecules that the ape parasite binds to. At some point no earlier than 300,000 years ago, she says, the gorilla parasite adapted to human blood and jumped species.

For Sufferers of an Early-Onset Dementia, Career Choice May Determine Location of Disease in Brain

In an international study of patients with a devastating type of dementia that often strikes in middle age, researchers have found intriguing evidence that career choice may influence where the disease takes root in the brain. The study was led by Baycrest's Rotman Research Institute in collaboration with the Memory and Aging Centre at the University of California, San Francisco and several U.S. and European clinical sites. It appears online today in the Article in Press section of the journal *Neuropsychologia*, ahead of publication.

Researchers conducted a multi-centre, retrospective chart review of brain imaging and occupation data from 588 patients diagnosed with frontotemporal lobar degeneration (FTLD), sometimes referred to as frontotemporal dementia (FTD). Among the dementias affecting those 65 years and younger, FTLT is as common as Alzheimer's disease. Like Alzheimer's, it is progressive and fatal. Unlike Alzheimer's, which tends to affect both sides of the brain equally, FTLT often manifests on either the left or the right side of the brain, then becomes more widespread as the disease progresses. Typical symptoms include changes in personality and behaviour, and a decline in language skills.

For this study, each patient's occupation was rated with scores derived from an occupation database published by the U.S. Department of Labor. The scores indicated the skills required for the occupation, including verbal, physical and visuospatial skills. For example, a school principal would receive a higher rating for verbal skills than for visuospatial skills, whereas a flight engineer would show the opposite pattern. Both of these professions would score lower on physical skills than a firefighter.



FTLD patients with professions ranked highly for verbal skills, such as chief executive, showed atrophy in right temporal lobe. In those with professions ranked lower for verbal skills, such as art director, atrophy was identified in left temporal lobe. (Credit: Baycrest)

The researchers correlated each patient's occupation scores with the location of brain tissue loss as determined from brain imaging results. They found that patients with professions rated highly for verbal skills, such as school principals, had greater tissue loss on the right side of the brain, whereas those rated low for verbal skills, such as flight engineers, had greater tissue loss on the left side of the brain. This effect was expressed most clearly in the temporal lobes of the brain.

"The disease appeared to attack the side of the brain that was the least used in the patient's professional life," said Dr. Nathan Spreng, who conducted the study as a psychology graduate student at Baycrest and is now a post doctoral fellow in the Department of Psychology at Harvard University.

The brain's left hemisphere, particularly the temporal lobe, is specialized for language and verbal skills. In occupations ranked highly for verbal skills, tens of thousands of hours of applying these skills may build reserve capacity by strengthening connections in the brain's left hemisphere, making it more resistant to damage due to FTLT, suggested Dr. Spreng. This process may also make the right hemisphere, which is less concerned with verbal tasks, more vulnerable to dementia through disuse.

Yet the researchers could not rule out an alternative explanation. "There may be an undetected functional impairment related to FTLT in these patients that biases them toward a certain career path decades before they get sick," said Dr. Brian Levine of the Rotman Research Institute and senior author on the study.

What is common to both explanations is that the patients' selection and practice of an occupation early in life was related to their brain changes later in life. The authors cautioned that the results were limited to FTLT and may not hold for other brain diseases or conditions.

There is no evidence that someone with a particularly verbal or non-verbal profession is vulnerable to brain disease. However, if that person were to develop FTLT (affecting approximately 250,000 Americans and 25,000 Canadians a year), the location of the disease may relate to occupational practice. Further research will be needed to determine how strong a predictor occupation may be for hemispheric localization of the disease.

The study was funded by the Canadian Institutes of Health Research and the National Institute of Child Health and Human Development.

Story Source: The above story is reprinted (with editorial adaptations by ScienceDaily staff) from materials provided by Baycrest Centre for Geriatric Care.

Journal Reference: I. R. Nathan Spreng, Howard J. Rosen, Stephen Strother, Tiffany W. Chow, Janine Diehl-Schmid, Morris Freedman, Neill R. Graff-Radford, John R. Hodges, Anne M. Lipton, Mario F. Mendez. Occupation attributes relate to location of atrophy in frontotemporal lobar degeneration. *Neuropsychologia*, 2010; DOI: 10.1016/j.neuropsychologia.2010.08.020

New Drug Could Help Stop the Spread of Disease from Coughs, Researchers Believe

What if there was a drug that could completely eliminate airborne disease transmission that occurs when someone coughs? Researchers at the University of Alberta believe they have found a way to achieve this.

The idea behind this work came from Malcolm King and his research associate Gustavo Zayas, who work in the Division of Pulmonary Medicine at the U of A's Faculty of Medicine & Dentistry. King and Zayas developed a drug that, when inhaled, would reduce or eliminate the amount of droplets, called bioaerosol, coming out of the mouth when a disease-infected person coughs. These airborne particles can stay in the air for minutes and sometimes even hours.

In order to help perfect this drug King and Zayas enlisted in the expertise of PhD student Anwarul Hasan and associate professor Carlos Lange, both from the Faculty of Engineering's mechanical engineering department. It was Hasan and Lange's role to find out how the size and amount of the cough-emitted droplets are affected by the new drug.

After five years of research, using a simulated cough machine, Hasan discovered how the new drug can manipulate the properties of the lung fluid to almost completely suppress the emission of droplets, a research first. This discovery provides a clear target for the new drug in its early phases of development.

King and Zayas are moving forward to develop the drug in the form of a spray and plan to perform clinical trials in hopes that one day this drug could not only help stop the spread of a pandemic outbreak, but also protect nurses, doctors and other front-line health care professionals.

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

Journal Reference: 1. MD. Anwarul Hasan, Carlos F. Lange, Malcolm L. King. Effect of artificial mucus properties on the characteristics of airborne bioaerosol droplets generated during simulated coughing. *Journal of Non-Newtonian Fluid Mechanics*, 2010; DOI: 10.1016/j.jnnfm.2010.07.005

Imaging study provides new view of multiple sclerosis

Scientists have uncovered an alternative source for some of the damage associated with multiple sclerosis (MS), an incurable neuroinflammatory disorder. The research, published online by Cell Press on September 23rd in the journal *Immunity*, reveals a direct interaction between immune cells and neurons that plays a significant role in neuronal injury and may respond to therapeutic intervention.

MS is an autoimmune disease in which a person's own immune system attacks their central nervous system. Symptoms of MS are variable depending on which nerves are affected, but often include muscle weakness, numbness and visual disturbances. Research has shown that MS is caused by damage to the protective myelin sheath, an insulating substance that surrounds nerve processes and is critical for transmission of nerve impulses.

Research has also indicated that direct damage to neurons is prominent in early disease stages. "The contribution of direct neuronal damage to MS pathology has been debated since the first description of the disease," explains senior study author, Professor Frauke Zipp, from Johannes Gutenberg University Mainz in Germany. "Although many different theories about possible underlying mechanisms have been proposed, such as neuron damage being a secondary effect of the disrupted myelin sheath, actual events leading to neural damage are not well understood."

Dr. Zipp and colleagues studied the role of immune cells in neuronal damage in mice with experimental autoimmune encephalomyelitis (EAE, an animal model of MS) by monitoring the development of neuroinflammatory lesions with sophisticated imaging techniques. They observed direct synapse-like interactions between immune cells and neurons. Immune cells called Th17 cells, which have been linked to autoimmune inflammation, induced localized toxic changes in neuronal calcium levels. This is significant because fluctuations in neuronal intracellular calcium levels that were linked with cell injury were partially reversible when cells were exposed to compounds used to treat excitotoxicity.

These results highlight a specific interaction between the immune system and the nervous system, implicating direct neuronal damage in autoimmune-mediated inflammation. "Our use of live-imaging during disease has led to the characterization of neuronal dysfunction as early and potentially reversible, and suggests that immune-mediated disturbances of the neurons themselves contribute to multiple sclerosis, in addition to interruptions in nerve cell transmission as a result of changes to the myelin sheath," concludes Professor Zipp. "Furthermore, immune-mediated reversible calcium increases in neurons are a viable target for future therapeutics."

The researchers include Volker Siffrin, University Medical Center Mainz, Johannes Gutenberg University Mainz, Mainz, Germany, Max Delbrück Center for Molecular Medicine Berlin-Buch, Berlin, Germany; Helena Radbruch, Max Delbrück Center for Molecular Medicine Berlin-Buch, Berlin, Germany, Charité' – University Medical Center Berlin, Berlin, Germany; Robert Glumm, Max Delbrück Center for Molecular Medicine Berlin-Buch, Berlin, Germany, Charité' – University Medical Center Berlin, Berlin, Germany; Raluca Niesner, Max Delbrück Center for Molecular Medicine

Berlin-Buch, Berlin, Germany, Charite' – University Medical Center Berlin, Berlin, Germany; Magdalena Paterka, Max Delbrück Center for Molecular Medicine Berlin-Buch, Berlin, Germany; Josephine Herz, Max Delbrück Center for Molecular Medicine Berlin-Buch, Berlin, Germany, Charite' – University Medical Center Berlin, Berlin, Germany; Tina Leuenberger, Max Delbrück Center for Molecular Medicine Berlin-Buch, Berlin, Germany; Sabrina M. Lehmann, Institute of Cell Biology and Neurobiology, Charite' —University Medicine Berlin, Berlin, Germany; Sarah Luenstedt, Max Delbrück Center for Molecular Medicine Berlin-Buch, Berlin, Germany, Charite' – University Medical Center Berlin, Berlin, Germany; Jan Leo Rinnenthal, Max Delbrück Center for Molecular Medicine Berlin-Buch, Berlin, Germany; Gregor Laube, Institute of Cell Biology and Neurobiology, Charite' —University Medicine Berlin, Berlin, Germany; Herve' Luche, University Clinics Ulm, Ulm, Germany; Seija Lehnardt, Institute of Cell Biology and Neurobiology, Charite' —University Medicine Berlin, Berlin, Germany; Hans-Joerg Fehling, University Clinics Ulm, Ulm, Germany; Oliver Griesbeck, Max Planck Institute of Neurobiology, Martinsried, Germany; and Frauke Zipp, University Medical Center Mainz, Johannes Gutenberg University Mainz, Mainz, Germany, Max Delbrück Center for Molecular Medicine Berlin-Buch, Berlin, Germany.

City living helped humans evolve immunity to TB

New research has found that a genetic variant which reduces the chance of contracting diseases such as tuberculosis and leprosy is more prevalent in populations with long histories of urban living.

The research, published in the journal *Evolution*, shows that in areas with a long history of urban settlements, today's inhabitants are more likely to possess the genetic variant which provides resistance to infection.

In ancient cities, poor sanitation and high population densities would have provided an ideal breeding ground for the spread of disease. Natural selection should mean that humans would have developed resistance to disease in long-standing urbanised populations over time. However, this association has been very difficult to assess - especially in prehistory.

Now, scientists from UCL (University College London) and Royal Holloway have tested the theory by analysing DNA samples from 17 different human populations living across Europe, Asia and Africa. In addition, they searched archaeological and historical literature to find the oldest records of the first city or urban settlement in these regions.

By comparing rates of genetic disease resistance with urban history, they showed that past exposure to pathogens led to disease resistance spreading through populations, with our ancestors passing their resistance to their descendents.

"The results show that the protective variant is found in nearly everyone from the Middle East to India and in parts of Europe where cities have been around for thousands of years" said Professor Mark Thomas from the Department of Genetics, Evolution and Environment at UCL (University College London).

Dr Ian Barnes, from the School of Biological Sciences at Royal Holloway, said: "The method we have employed here makes novel use of historical and archaeological data, as a means to explain the distribution and frequency of a genetic variant, and to identify a source of natural selection.

"This seems to be an elegant example of evolution in action. It flags up the importance of a very recent aspect of our evolution as a species, the development of cities as a selective force. It could also help to explain some of the differences we observe in disease resistance around the world," added Dr Barnes.

"Population density seems to play an important role in shaping so many aspects of our species", said Prof Thomas. "It was a vital factor in our species maintaining the complex skills and culture that distinguish us from other primates. It drove many of the genetic differences we see today between different populations from around the world. And now, it seems, it also influenced how infectious diseases spread in the past and how we evolved to resist those diseases".

The research was funded by the Natural Environment Research Council and the Arts and Humanities Research Council (Centre for the Evolution of Cultural Diversity).

3. '**Ancient urbanisation predicts genetic resistance to tuberculosis**' is published in the journal *Evolution*. Journalists can obtain copies of the paper by contacting UCL Media Relations.

Mimicking Nature, Water-Based 'Artificial Leaf' Produces Electricity

A team led by a North Carolina State University researcher has shown that water-gel-based solar devices -- "artificial leaves" -- can act like solar cells to produce electricity. The findings prove the concept for making solar cells that more closely mimic nature. They also have the potential to be less expensive and more environmentally friendly than the current standard-bearer: silicon-based solar cells.

The bendable devices are composed of water-based gel infused with light-sensitive molecules -- the researchers used plant chlorophyll in one of the experiments -- coupled with electrodes coated by carbon materials, such as carbon nanotubes or graphite. The light-sensitive molecules get "excited" by the sun's rays to produce electricity, similar to plant molecules that get excited to synthesize sugars in order to grow, says NC

State's Dr. Orlin Velev, Invista Professor of Chemical and Biomolecular Engineering and the lead author of a paper published online in the Journal of Materials Chemistry describing this new generation of solar cells.

Velev says that the research team hopes to "learn how to mimic the materials by which nature harnesses solar energy." Although synthetic light-sensitive molecules can be used, Velev says naturally derived products -- like chlorophyll -- are also easily integrated in these devices because of their water-gel matrix.

Now that they've proven the concept, Velev says the researchers will work to fine-tune the water-based photovoltaic devices, making them even more like real leaves.

"The next step is to mimic the self-regenerating mechanisms found in plants," Velev says. "The other challenge is to change the water-based gel and light-sensitive molecules to improve the efficiency of the solar cells."

Velev even imagines a future where roofs could be covered with soft sheets of similar electricity-generating artificial-leaf solar cells.

"We do not want to overpromise at this stage, as the devices are still of relatively low efficiency and there is a long way to go before this can become a practical technology," Velev says. "However, we believe that the concept of biologically inspired 'soft' devices for generating electricity may in the future provide an alternative for the present-day solid-state technologies."

Researchers from the Air Force Research Laboratory and Chung-Ang University in Korea co-authored the study. The study was funded by the Air Force Research Laboratory and the U.S. Department of Energy. The work is part of NC State's universitywide nanotechnology program, Nano@NC State.

NC State's Department of Chemical and Biomolecular Engineering is part of the university's College of Engineering.

The above story is reprinted (with editorial adaptations by ScienceDaily staff) from materials provided by North Carolina State University.

Journal Reference: I. Hyung-Jun Koo, Suk Tai Chang, Joseph M. Slocik, Rajesh R. Naik, Orlin D. Velev. Aqueous soft matter based photovoltaic devices. *Journal of Materials Chemistry*, 2011; DOI: 10.1039/c0jm01820a

Psychologist Shows Why We 'Choke' and How to Avoid It

A star golfer misses a critical putt; a brilliant student fails to ace a test; a savvy salesperson blows a key presentation. Each of these people has suffered the same bump in mental processing: They have just choked under pressure.

It's tempting to dismiss such failures as "just nerves." But to University of Chicago psychologist Sian Beilock, they are preventable results of information logjams in the brain. By studying how the brain works when we are doing our best -- and when we choke -- Beilock has formulated practical ideas about how to overcome performance lapses at critical moments.

"Choking is suboptimal performance, not just poor performance. It's a performance that is inferior to what you can do and have done in the past and occurs when you feel pressure to get everything right," said Beilock, an associate professor in psychology.

Preventing choking in sports Some of the most spectacular and memorable moments of choking occur in sports when the whole world is watching. Many remember golfer Greg Norman's choke at the 1996 U.S. Masters. Norman had played brilliantly for the first three days of the tournament, taking a huge lead. But on the final day, his performance took a dive, and he ended the Masters five shots out of first place.

Choking in such cases happens when the polished programs executed by the brains of extremely accomplished athletes go awry. In "Choke," Beilock recounts famous examples of these malfunctions in the context of brain science to tell the story of why people choke and what can be done to alleviate it.

Thinking too much about what you are doing, because you are worried about losing the lead (as in Norman's case) or worrying about failing in general, can lead to "paralysis by analysis." In a nutshell, paralysis by analysis occurs when people try to control every aspect of what they are doing in an attempt to ensure success.

Unfortunately, this increased control can backfire, disrupting what was once a fluid, flawless performance.

"My research team and I have found that highly skilled golfers are more likely to hole a simple 3-foot putt when we give them the tools to stop analyzing their shot, to stop thinking," Beilock said. "Highly practiced putts run better when you don't try to control every aspect of performance." Even a simple trick of singing helps prevent portions of the brain that might interfere with performance from taking over, Beilock's research shows.

Preventing choking on tests and in business The brain also can work to sabotage performance in ways other than paralysis by analysis. For instance, pressure-filled situations can deplete a part of the brain's processing power known as working memory, which is critical to many everyday activities.

Beilock's work has shown the importance of working memory in helping people perform their best, in academics and in business. Working memory is lodged in the prefrontal cortex and is a sort of mental scratch pad that is temporary storage for information relevant to the task at hand, whether that task is doing a math problem at the board or responding to tough, on-the-spot questions from a client. Talented people often have

the most working memory, but when worries creep up, the working memory they normally use to succeed becomes overburdened. People lose the brain power necessary to excel.

One example is the phenomenon of "stereotype threat." This is when otherwise talented people don't perform up to their abilities because they are worried about confirming popular cultural myths that contend, for instance, that boys and girls naturally perform differently in math or that a person's race determines his or her test performance.

Beilock's research is the basis of her new book, "Choke: What the Secrets of the Brain Reveal About Getting it Right When You Have To," published Sept. 21 by Simon and Schuster, Free Press.

In Choke, Beilock describes research demonstrating that high-achieving people underperform when they are worried about confirming a stereotype about the racial group or gender to which they belong. These worries deplete the working memory necessary for success. The perceptions take hold early in schooling and can be either reinforced or abolished by powerful role models.

In one study, researchers gave standardized tests to black and white students, both before and after President Obama was elected. Black test takers performed worse than white test takers before the election. Immediately after Obama's election, however, blacks' performance improved so much that their scores were nearly equal with whites. When black students can overcome the worries brought on by stereotypes, because they see someone like President Obama who directly counters myths about racial variation in intelligence, their performance improves.

Beilock and her colleagues also have shown that when first-grade girls believe that boys are better than girls at math, they perform more poorly on math tests. One big source of this belief? The girls' female teachers. It turns out that elementary school teachers are often highly anxious about their own math abilities, and this anxiety is modeled from teacher to student. When the teachers serve as positive role models in math, their male and female students perform equally well.

Meditation and practice can help Even when a student is not a member of a stereotyped group, tests can be challenging for the brightest people, who can clutch if anxiety taps out their mental resources. In that instance, relaxation techniques can help.

In tests in her lab, Beilock and her research team gave people with no meditation experience 10 minutes of meditation training before they took a high-stakes test. Students with meditation preparation scored 87, or B+, versus the 82 or B- score of those without meditation training. This difference in performance occurred despite the fact that all students were of equal ability.

Stress can undermine performance in the world of business, where competition for sales, giving high-stakes presentations or even meeting your boss in the elevator are occasions when choking can squander opportunities.

Practice helps people navigate through these tosses on life's ocean. But, more importantly, practicing under stress -- even a moderate amount -- helps a person feel comfortable when they find themselves standing in the line of fire, Beilock said. The experience of having dealt with stress makes those situations seem like old hat. The goal is to close the gap between practice and performance.

A person also can overcome anxiety by thinking about what to say, not what not to say, said Beilock, who added that staying positive is always a good idea.

"Think about the journey, not the outcome," Beilock advised. "Remind yourself that you have the background to succeed and that you are in control of the situation. This can be the confidence boost you need to ace your pitch or to succeed in other ways when facing life's challenges."

I yam what I yam--and what I yam is endangered and under-researched

By John Platt Saturday, September 25, 2010

Yams are an important food crop in Africa, where the tubers are eaten by 60 million people every day, as well as in other parts of the world. But despite the yam's importance as a food source, science doesn't really know that much about yams or exert much effort in conserving them. That needs to change, says the Global Crop Diversity Trust (GCDT), which has launched a worldwide effort to collect, catalogue and preserve thousands of yam varieties before many of them disappear.

It is not an unlikely scenario, as some yam varieties or species are already endangered. In Uganda, for example, a variety of climbing yam known locally as imbama faces extinction and is now found only in remote, mountainous areas. The climbing yam grows on vines that, as their name implies, climb tall trees—but most of the trees in the Bugisu region of Uganda have been cut down to make room for fast-growing human settlements and agriculture, according to a report in the Uganda news Web site The New Vision. A banana blight, which killed many trees in 2001, further hurt the imbama's chances for survival.

To prevent further loss of important crops, the GCDT hopes to collect genes from 3,000 yam varieties in Africa, China the Philippines and other countries. It is a tough task: unlike seed-crop species, you can't collect

and preserve yam seeds, because they are tubers and don't produce seeds that can be dried like many other plants do. Instead, tissue samples for the yam project are being cryopreserved in liquid nitrogen by the International Institute for Tropical Agriculture (IITA) in Ibadan, Nigeria.

In addition to preserving the biodiversity of the yams, the project aims to find the yam varieties with the greatest crop yields and strongest resiliency to disease and climate change. "It's really akin to putting money in the bank," Cary Fowler, executive director of the GCDT in Rome, said in a prepared statement. "All crops routinely face threats from plant pests, disease, or shifting weather patterns, and a country's ability to breed new varieties to overcome these challenges is directly tied to what they have in the bank, not just in terms of financial resources but in terms of the diversity in their crop collections."

A single yam tuber can be as large as 2.5 meters long and weigh up to 70 kilograms, making them a productive and valuable crop for farmers.

There have been other collections of yam biodiversity, but some varieties were lost in Ivory Coast's 2002 civil war, and another collection in the Togolese Republic was destroyed in a fire.

Postoperative High Blood Sugar Appears to Be Associated With Surgical Site Infection

High blood glucose levels after surgery may be an important risk factor for infection at the surgical site in patients having general surgery, according to a report in the September issue of Archives of Surgery, one of the JAMA/Archives journals.

Surgical site infection accounts for 14 percent to 17 percent of hospital-acquired infections, making it the third most common type of infection acquired at health-care facilities and the most common among patients having surgery, according to background information in the article. "Studies have shown that these infections prolong the hospital length of stay after surgery, increase rehospitalization rates and dramatically increase the use of emergency services and health care costs," the authors write.

Ashar Ata, M.B.B.S., M.P.H., and colleagues at Albany Medical College, Albany, N.Y., reviewed the medical records of patients who had general or vascular surgery between Nov. 1, 2006, and April 30, 2009. A total of 2,090 patients were randomly selected from a quality improvement database and then matched with medical records to obtain information about postoperative glucose values. These values were available for 1,561 patients, including 559 who had vascular surgery, 226 who had colorectal surgery and 776 who had a type of general surgery other than colorectal. Overall, 7.42 percent of the patients developed surgical site infections, including 14.11 percent of those who had colorectal surgery, 10.32 percent who had vascular surgery and 4.36 percent of those who had other general surgery.

Among general surgery patients, factors associated with surgical site infection included age, emergency status, physical status as classified by the American Society of Anesthesiologists, time in surgery, diabetes and high postoperative blood glucose (hyperglycemia). However, after adjusting for postoperative blood glucose level, all other factors were not significant predictors of infection. A subanalysis of colorectal surgery patients found that a postoperative serum glucose level higher than 140 milligrams per deciliter was the only significant predictor of surgical site infection.

Among vascular surgery patients, operative time and diabetes were the only significant predictors of surgical site infection, which was not associated with postoperative hyperglycemia.

Hyperglycemia may impair the immune system, and insulin may have anti-inflammatory and other anti-infective activities. However, it is possible that the accumulation of other risk factors for surgical site infection cause hyperglycemia rather than vice versa; hence, further study is needed, the authors note.

"In conclusion, we found postoperative hyperglycemia to be the most important risk factor for surgical site infection in general and colorectal cancer surgery patients, and serum glucose levels higher than 110 milligrams per deciliter were associated with increasingly higher rates of post-surgical infection," they continue. "If hyperglycemia is confirmed in future prospective studies with better postoperative glucose data to be an independent risk factor for postsurgical infection in general surgery patients, this would give surgeons a modifiable variable to reduce the incidence of postoperative infection."

The above story is reprinted (with editorial adaptations by ScienceDaily staff) from materials provided by JAMA and Archives Journals.

Journal Reference: 1. A. Ata, J. Lee, S. L. Bestle, J. Desemone, S. C. Stain. Postoperative Hyperglycemia and Surgical Site Infection in General Surgery Patients. *Archives of Surgery*, 2010; 145 (9): 858 DOI: 10.1001/archsurg.2010.179

Inhibiting cell signaling pathway may improve bone marrow transplant success rate

CINCINNATI – Identification of a molecular communications pathway that influences the mobilization of hematopoietic (blood) stem cells could lead to targeted therapies for improving bone marrow transplant success rates. In a bed-side to bench approach, researchers at Cincinnati Children's Hospital Medical Center report Sept. 26 in *Nature Medicine* that pharmacological inhibition of a signaling pathway triggered by Egfr (epidermal

growth factor receptor) increased the mobilization of hematopoietic stem cells in mice. The finding provides a scientific basis for enhancing the effectiveness of autologous bone marrow transplants, in which the recipient donates his or her own stem cells prior to the procedure.

"Up to 10 percent of bone marrow donors fail to mobilize sufficient numbers of stem cells, which impedes autologous transplants and significantly delays transplant recovery time," said Hartmut Geiger, Ph.D., a researcher in the division of Experimental Hematology/Cancer Biology at Cincinnati Children's and senior investigator on the study. "Our findings reveal a new rationale for targeted pharmacological approaches to improve stem cell mobilization and transplantation outcomes."

Autologous bone marrow transplant is often used to restore a person's hematologic system after receiving radiation therapy for cancer treatment. Radiation exposure damages the system, which produces all of the body's blood cell types – including those vital to immune system function.

In clinical hematopoietic stem cell (HSC) transplants, the preferred source for mobilizing hematopoietic stem cells from bone marrow into peripheral circulating blood is by targeting a signaling protein called granulocyte colony stimulating factor, or G-CSF. G-CSF stimulates bone marrow so that it releases HSCs into circulating peripheral blood. Mobilization failures and delayed recovery rates suggest the need for a deeper molecular understanding of the mobilization process to further improve the treatment.

This prompted Dr. Geiger and his colleagues to search for therapeutic targets that would boost stem cell mobilization. They work with specially bred mice (recombinant inbred mice) in their research because much of the current knowledge about cellular and molecular regulation of G-CSF-induced stem cells comes from mouse studies. Because the G-CSF process that mobilizes hematopoietic stem and progenitor cells is conserved through evolution between mice and humans, inbred mouse strains are valuable surrogates for studies that can be translated to people.

Working from their previously published research, the scientists were able track a region on chromosome 11 in their mouse models that regulates G-CSF-induced mobilization of HSCs. Of 12 genes located in this region, testing pointed to *Egfr*, which is a protein involved in triggering molecular reactions that regulate cell growth, multiplication and migration. Mutations in *Egfr* have also been linked to cancer.

The researchers tested the G-CSF/*Egfr* pathway's influence on stem cell mobilization in several ways, including genetic manipulation and pharmacologic intervention. In one key experiment, involving mice undergoing bone marrow transplant, the researchers used an anti-cancer drug (Erlotinib) that blocks the *Egfr* pathway to enhance HSC mobilization. These mice experienced a 5-fold increase in stem cell mobilization.

"This suggests a possible application of these findings into the clinic," Dr. Geiger said. "Experiments are already planned to test whether this novel treatment for enhancing HSC mobilization might translate into novel therapies for patients."

First author on the study was Marnie A. Ryan, a research fellow of Dr. Geiger's laboratory team.

Funding support came from the National Institute of Health (NIH) through multiple grants and the Translational Research Initiative at Cincinnati Children's Hospital Medical Center.

Other institutions collaborating on the study include: the department of Dermatology and Allergic Diseases, University of Ulm, Ulm, Germany; Institute of Molecular and Clinical Immunology, Otto von Guericke University, Magdeburg, Germany; department of Biological Sciences, Eastern Kentucky University, Richmond, Ky.; department of Internal Medicine, Markey Cancer Center, Division of Hematology/Oncology, University of Kentucky, Lexington, Ky., and the Hoxworth Blood Center, University of Cincinnati College of Medicine.

Increasing Taxes on Alcoholic Beverages Reduces Disease, Injury, Crime and Death Rates, Study Finds

Increasing the costs to consumers of beer, wine, and hard liquor significantly reduces the rates of a wide range of alcohol-related deaths, diseases, injuries, and other problems, according to a new study published in the online edition of the American Journal of Public Health and scheduled for inclusion in the November print edition.

Researchers at the University of Florida (UF) report that public policies that increase the price of alcoholic beverages, such as increases in alcohol excise taxes, not only reduce drinking but also significantly reduce most of the negative and costly outcomes associated with alcohol.

According to the researchers, alcohol taxes have considerably larger effects than prevention programs on a state's burden of alcohol-related problems. The results suggest that doubling the average state tax on alcohol would be associated, on average, with a 35 percent reduction in alcohol-related mortality, an 11 percent reduction in traffic crash deaths, a 6 percent reduction in STDs, a 2 percent reduction in violence, and a 1.4 percent reduction in crime.

"Our meta-analysis cumulated information from all the published scientific research on this topic over the past half century, and results clearly show increasing the price of alcohol will result in significant reductions in

many of the undesirable outcomes associated with drinking," said Alexander C. Wagenaar, PhD, professor of health outcomes and policy at UF College of Medicine and lead author of the study. "Simply adjusting decades-old tax rates to account for inflation could save thousands of lives and billions of dollars in law enforcement and health care costs."

For this meta-analysis study, the researchers identified 50 published research papers containing 340 estimates of the effects of alcohol taxes or prices on the rates of a variety of outcomes, including: all-cause morbidity and mortality, alcohol-related diseases or injuries, violence, suicide, traffic safety outcomes, STDs and risky sexual behaviors, other drug use, and crimes and misbehaviors. Through a meta-analysis of the aggregate data from all those studies, the researchers found that alcohol prices and taxes are significantly and inversely related to all outcome categories examined except suicide, for which data were too sparse to draw a firm conclusion.

"Results are surprisingly consistent," said Wagenaar. "With the sole exception of suicide rates, every category of outcome examined shows a significant effect of alcohol taxes and prices."

This study follows a previous meta-analysis study through which these researchers found that a 10 percent increase in alcohol price results in about a 5 percent reduction in alcohol consumption. That study examined 112 research papers containing 1,004 estimates of the effects of alcohol prices on alcohol sales and drinking behaviors.

"Taken together, these two studies establish beyond any reasonable doubt that, as the price of alcohol goes up, alcohol consumption and the rates of adverse outcomes related to consumption go down," said Wagenaar. "The strength of these findings suggests that tax increases may be the most effective way we have to prevent excessive drinking -- and also have drinkers pay more of their fair share for the damages caused and costs incurred."

Wagenaar's study, Effects of Alcohol Tax and Price Policies on Morbidity and Mortality: A Systematic Review, was funded by the Robert Wood Johnson Foundation.

The above story is reprinted (with editorial adaptations by ScienceDaily staff) from materials provided by Burness Communications, via EurekAlert!, a service of AAAS.

Journal Reference: 1. Alexander C. Wagenaar, Amy L. Tobler, and Kelli A. Komro. *Effects of Alcohol Tax and Price Policies on Morbidity and Mortality: A Systematic Review. American Journal of Public Health, 2010; DOI: 10.2105/AJPH.2009.186007*

Swarm of 30,000 Earthquakes Reveals Volcanic Potential

By Charles Q. Choi, OurAmazingPlanet Contributor

A swarm of thousands of earthquakes that struck the corner of Saudi Arabia nearest to Egypt in 2009 helped reveal that the area is unexpectedly volcanically active, scientists now report.

The seismic readings that researchers managed to collect from these quakes could help predict when volcanoes might erupt in the future, investigators added.

Scientists had largely thought northwest Saudi Arabia was quiet, geologically speaking. Few earthquakes and few volcanic eruptions have been recorded there in the past millennium.

However, between April and June 2009, more than 30,000 earthquakes struck an ancient lava field there named Harrat Lunayyir, with 19 earthquakes of magnitude 4 or greater striking at the swarm's peak on May 19, including a magnitude 5.4 quake that fractured walls in the town of Al Ays. Sensors even suggested that a volcanic eruption was possible. Alarmed, the Saudi Arabian government then evacuated 40,000 people from the region.

Part of Red Sea Parting

The lava field of Harrat Lunayyir is part of a "lava province" roughly 70,000 square miles (180,000 square kilometers) in size that began forming 30 million years ago when Arabia split from Africa, rifting that helped create the Red Sea. Harrat Lunayyir was previously considered inactive because of its location on the margins of the continental rift, nearly 120 miles (200 kilometers) away from the active center of spreading beneath the Red Sea.

Still, "the Red Sea rift is a very active place to start with, with a chain of volcanoes down the middle of it that we're rarely aware of because they are underwater," said researcher John Pallister, a volcanologist and chief of the U.S. Geological Survey's volcano disaster assistance program. "When continents are being pulled apart as you have there, you'll often see intrusions of magma on the shoulders of the rift."

The researchers discovered a roughly 2-mile-long (3-km-long) rupture had opened up in the area and widened to 5 miles (8 km) long during the most powerful quake. Satellite radar images suggested the most likely cause of this fault was magma intruding upward over a 6-mile-long (10-km-long) stretch.

Based on these findings, on June 19, 2009, the researchers forecast a moderate chance of a volcanic eruption and a low probability of magnitude 5 or greater earthquakes in the two months following. A decline of seismic

activity by August 2009 led the scientists to conclude the crisis had ended, allowing evacuees to return to their homes and daily lives.

Magma rises

Still, now that magma has risen to shallow levels roughly a mile (2 kilometers) below the surface of the Earth, eruptions remain possible, and the authorities have to remain vigilant, the researchers said.

"It is more likely that we'll get additional intrusions of magma and potentially even an eruption in this area — the pathway is prepared," Pallister told *Our Amazing Planet*.

The highly detailed readings the Saudi Geological Survey collected from these quakes might be able to help scientists forecast volcanic eruptions in the future, Pallister added.

Volcanic quakes often generate a mix of high- and low-frequency seismic waves that could yield clues as to when an eruption might occur. These signals are often dulled by the nature of the earth they pass through, but when it came to the Arabian quakes, they were detected through the crystalline rocks of the area quite clearly. The low-frequency seismic waves detected during the quakes seemed to show magma flowing under the earth, while the high-frequency waves indicated fracturing of crystalline rocks as magma crept toward the surface.

"Understanding what these signals mean could prove instrumental to forecasting what can be deadly events worldwide," Pallister said.

The scientists detailed their findings online Sept. 26 in the journal *Nature Geoscience*.